THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXXVII., No. 5. Whole No. 1,677. | NEW YORK, MONDAY, JULY 29, 1907. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. | THOMAS J. CUNNINGHAM, ELBERT P. CALLENDER. } Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, New York.

Telephone.—2996 John.

Terms of Subscription, Including Postage.—For the United States, $3; Canada, $4 per annum. European countries, $5 (£1—25 francs).

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A.M. Callender & Co.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

NOTICE—
Wrinkle Department, The American Gas Institute..... 177
OFFICIAL NOTICE—
Change, Place of Meeting, Michigan Gas Association..... 177
EDITORIAL—
Legislation and Law.—No. I., by T. J. C..... 177
*Gas Arc Signs, by "Engineer"..... 178
*A Portable Photometer, by Mr. J. A. Evans..... 179
*Color Values of Artificial Lights, by Mr. G. H. Stickney..... 179
*Some Details of Concrete Construction, by Mr. L. J. Hotchkiss... 180
*Graphical Method of Determining Power Factor from Wattmeter Readings, by Mr. A. A. Radtke..... 183
The Sale of Gas, by Mr. F. W. Goodenough..... 184
SPECIAL ENGLISH CORRESPONDENCE..... 189
Technical Meetings—Some Questions of the Day.
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 190
France and Its Aero Club—Riley Slapped Her—Supt. Bullock Makes Good—Annual Meeting, Easthampton, Mass.—Ditto, Taunton, Mass.—Firemen Shall Gas Men Be—Mr. Schofield Will Use More Gas—Annual Meeting, Albany, N. Y.—The New Haven Company's Outing—Personal—A Queer Accident—Hedrick (Ia.) Sells Its Gas Plant—The Sign May Stay—Damage Done by a Flash of Lighting—Again, a Tax Payment—A Decision that Looks Unfair—And Other Items.
The Market for Gas Securities..... 192

[NOTICE.]

Wrinkle Department, the American Gas Institute.

To the Membership, American Gas Institute: All members of the American Gas Institute, and others interested, are requested to contribute a description of any novel device or scheme covering any feature of the gas business. Every department of every company uses some novel stunt which would be of value to others. The object of this department is to compile such information. The value of the report depends entirely on the co-operation received. Send in your contribution at once to

MILAN R. BUMP, Editor,
60 Wall street, New York.

[OFFICIAL NOTICE.]

Change of Meeting Place, Michigan Gas Association.

MICHIGAN GAS ASSOCIATION,
OFFICE OF SECRETARY,
DETROIT, MICH., July 1, 1907.

To the Members, Michigan Gas Association: Owing to unavoidable delays in the completion of the new hotel at Kalamazoo, Mich., the Executive Committee has changed the place of meeting from Kalamazoo to Battle Creek, the meeting to be held September 18, 19 and 20, 1907. A notice will be sent in the near future giving full information in regard to hotels and programme, for papers as well as entertainment.

Respectfully,
ALONZO P. EWING, Secretary.

LEGISLATION AND LAW.—NO. I.

By T. J. C.

There can be no fair question as to the permanence of the fact that legislation is the base of all law, except the common law, but it is equally true that all legislation is not sound law; whence the necessity of tribunals to determine for a finality the laws that are equal and not uneven, that do not work good to one and ill to another. Pointed examples in this regard are the gas measures enacted by the New York State Legislature of 1905, which statutes apply with greatest stress to the companies doing business in Manhattan and Brooklyn boroughs. The main points sought to be covered were the fixing of the rates in the boroughs named, together with the declaring of certain pressure supply limits that should not be disregarded. An infraction of the provisions carried penalties that were heretofore unheard of, that were excessive, and, in fact, if exacted, were in effect worse than confiscatory. As these things were reported at the time of their occurring quite fully in the JOURNAL, their mere restatement here is sufficient for the present purpose.

When the time came for the enforcement of the statutes, the Consolidated Gas Company interposed the necessary appeals to the courts to stay the enforcing, pending a judicial threshing of the questions. The case was brought before the Circuit Court of the United States for the Southern District of New York, and on the order of the Honorable E. Henry Lacombe, Circuit Judge, Mr. Arthur H. Masten, as Master in Chancery, was appointed "To take the testimony, make all the needed computations, and find fully the facts." This was done, in a method the scope of which we venture to say was never exceeded in any case of even a fairly similar nature. The length and completeness of the examination, as to the bearing of the laws complained of in their effect on the Company and the consumer, are well shown in the report of the Master, as handed by him to the Court some weeks ago. His conclusions are largely in the main, in fact almost entirely so, favorable to the contentions of the plaintiff and are now before the Court for its final consideration.

As to the proceedings respecting the value of the property, physically and in money, as to charter rights, the cost of gas to manufacture and the like, being matters of monetary values principally, it is comparatively not an intricate process to adjust them under the statutes, although undoubtedly a process requiring much time and

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SMITHSONIAN DEPOSIT.

involving a fairly wide honest variance in opinion, but not so with the contention as to the franchise value. However, the State and the counties concerned, with an assiduity that well betokened unreasoning greed, having availed themselves of the provisions of the franchise laws to assess that value at a figure which would yield an enormous sum, contested strenuously the thought that, if the franchise were a money earner, its worth to the taxed should represent a tangible asset, one fit for capitalization. Under this head the Master's findings are specific, and it was not possible for the State to explain away the contention that a proper allowance for franchise valuation should be admitted, when the State itself was collecting a tax in 1906 for such purpose on a valuation fixed by its assessors in the sum of $31,900,000; of course it is presumed it is known that the act provides for the assessment of "tangible property" along with the "intangible property" as well. For the sake of clearness it might be well to here reproduce the following extract from the statute:

"A franchise, right, authority or permission specified in this subdivision shall for the purpose of taxation be known as a 'special franchise.' A special franchise shall be deemed to include the value of the tangible property of a person, copartnership, association or corporation situated in, upon, under or above any street, highway, public place or public waters in connection with their special franchise. The tangible property so included shall be taxed as part of the special franchise."

As it is a queer rule that will not guide according to its face, the testimony before the Master has convincingly shown that the face of this rule was not altogether made for the State.

However, as before stated, these matters were much easier of ascertainment between the parties to the action than were those that related to the actual fair selling price of gas in Greater New York and to the matter of pressure. Certainly the main contentions in such respects were between contenders, whose capacities for discrimination were as plus is to minus. On the one hand figured complainant, whose knowledge of the actual matter was acquired through practical experience, gained in the actual conduct of the second largest gas company in the world. On the other hand were those who sought to enforce a law, the provisions of which were made by legislators who, without consultation with those that did know, declared "These fiats are of ours. And we declare them in deference to a clamor that is even less knowledgable than is our knowledge on the subjects."

To the gas engineer the provisions of the statute respecting the distribution of gas, in so far as pressure conditions are concerned, would be laughable, were it not for the fact of the grave danger, to which the users of gas would be subjected, were such conditions enforced with the least possible rigor. The law declared in part that—

"The pressure of illuminating gas in any *service mains* in said city at any distance from the place of manufacture shall not be less than an inch, nor more than 2½ inches."

Under a strict interpretation and carrying out of that specification, we would like to know how gas could be safely transported, not up Morningside Heights but down the other side. Of course, gas will go up without difficulty, but to get it down after getting it up, without a trifle of effort that is decidedly more than coaxing, is respectfully referred to the Senators and Assemblymen and the Governor, who caused the measure to become spread on the statute books. The italics in the quoted section are ours, but the words are the words of the bill. The legislators knew that the conveyors were pipes, wherefore we must take it for granted that all pipes seem alike to them.

In this connection the testimony of one of the experts for the city (his name is Marks) was not very profound, although the remedy or way to equalize or confine the pressure within the named limits was expressive. Quoting from the Master's Report (page 142, section 568) we find the following:

"Mr. Marks, on behalf of the city, admits that at a height of 100 feet above sea level it is necessary to accept a minimum pressure of 1½, and a maximum pressure of 3 inches, and at a height of 200 feet a minimum pressure of 2 inches and a maximum pressure of 3½ inches. He testified, however, that he could comply with the law if allowed to expend whatever sum he deemed necessary for the purpose, which would involve, after a topographical survey showing differences in level, a segregation of mains according to those levels throughout the city, after which it would * * * then be necessary to see that in some method the pressure which comes from the holder usually should be so modified or regulated for each level that it would never go above 2½ inches or below 1 inch; and this is physically possible."

Yes; physically possible, but financially impossible with gas at very much in excess of $1 per 1,000, unless the plant were operated on municipal account, and that the municipality did not pay even cursory heed to the figures of the tax rate. It is also true that the oceans could be made into highways, if there were earth enough available to cause the water to fly into space. Yet this was a sample of the drivel which the authorities were pleased to pay for, and which the Company's witnesses were obliged to combat. The latter, however, was not difficult.

[Prepared for the JOURNAL.]

Gas Arc Signs.

By "ENGINEER."

Gas men are developing the gas arc sign business to important proportions by a system of advertising. One of the first things to do in introducing an improvement consists in advertising it by showing your own confidence in it; hence, a number of gas men in various parts of the country have adopted the policy of advertising their own business through the agency of the gas arc sign. Not long since the gas arc sign was practically unknown in the field of advertising, whereas there were electrical light signs of all kinds. The electric light people were not slow in advertising the fact that they were able to put an effective sign on the market, to be illuminated entirely by electrical currents. In order to illustrate the possibilities of the elec-light sign for business houses, samples of electric light signs were designed and constructed, these signs being placed in conspicuous places where the interested parties could see them, and very many orders were placed on the bases of these models of electrical sign lighting. Then the gas men proceeded to introduce improved forms of brilliant lighting for signs. During the past few years the business has increased to such size that one is justified in considering this an important branch of the gas lighting business. The writer has travelled much in recent years and has seen evidences of the ever-increasing demand for the advertising sign to be operated by gas. There are many business concerns so located that an electric lighted advertising sign would be impossible, hence the need of gas lighted signs.

The exterior and interior lighted signs answer two purposes. First, the sign with it in designs of forms or letters when lighted serves to distribute a volume of light wherever the sign may be placed. The light serves to draw attention and to light up the space which otherwise might be dark. Then the sign is useful for advertising purposes.

The advertising and lighting signs of whatever class may be placed under three heads, namely: The exterior signs, which are arranged in front of buildings, on roofs, along a fence line, or anywhere outside; second, the show window signs, which are employed not only to attract observation to the goods to be advertised, but to light up the show window; third, the interior signs which are employed in stores, offices, etc., to note some special line of goods on sale, and for the purpose of assisting in the lighting of the interior.

There is money in the gas sign business; the profits are arranged on a more liberal margin than is customary in the average run of gas lighting goods. The electrical people have established a rate of good proportions on electrical signs and the prices have been well sustained by the gas light people. Probably, one of the essential factors in the introduction of the gas arc sign in a center of commercial houses consists in putting out said signs as models. In one place where the gas arc signs were being introduced with considerable promptness, I noticed that one of the manufacturers and dealers of the signs operated a large sign like that shown in Fig. 1 on the front of the roof of his establishment.

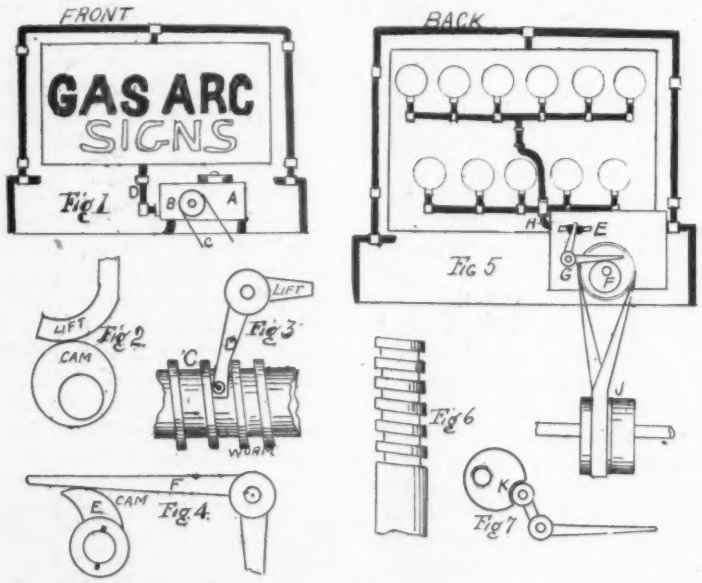
This brilliant sign reflected its light over the territory about for some distance, and it attracted much notice. It served as a beacon to light the surrounding country. In connection therewith advertisements were run in the papers and circulars were sent out, describing the simplicity of the mechanism and the comparatively low cost of the outfit as compared with other means of advertising. The light which was diffused over the area proved a happy factor in the sign, and many were purchased because of this reason. The structure is not complicated. It consists in the setting up of the pipe frame represented in black, which frame is fixed to the edge of the front of the building. Then the gas arcs are properly arranged at the back, so that there is a light back of each letter. The mechanical device below is fixed with its cams so as to turn off and on the lights. The lights are not turned low enough to make them go out, but are turned down just enough to darken the lettering. The lettering is on a transparent surface of glass, mica, or the like, the letters being blocked out with colors. Hence the letters are made to shine out brilliantly by means of the light in the rear of each. One of the simplest ways to effect the turning off and on of the gas supply is by using a cam and lever, in the case (*A*). The cam is revolved on a shaft by means of the belt (*C*) and the exterior wheel (*B*). The passage of the gas to the sign jets is through the pipe (*D*). The device is operated by a power from inside the building, through the agency of the belt.

The detail of the cam and lever is shown in the next figures. I noticed several types of cams and levers in use for the shutting off or

turning on of the gas. Fig. 2 is a plain lift cam. Fig. 3 a worm style, with the lever operated by the arm (*D*) which runs in the groove (*C*) of the worm shaft. Some of the turning off and turning on levers are moved as lever (*F*) by the turning cam (*E*), Fig. 4.

Fig. 5 is a rear view of one of the sign plates. An interior view of the mechanical case is given. The power can be obtained from any line of shafting below, or on thereof, or the same can be produced by a lad with a hand crank. Or as one party did, put up a windmill and use the power thereof. I saw compressed air power devices used in several cases. In the present case, the belt (*J*) is run by the turning shaft under the roof in one of the rooms. Power is thus transmitted to the driven wheel in the box on the roof, by passing the belt through belt holes properly sawed in the roof and protected with metal sides. The cam (*F*) is keyed on this shaft with the driven wheel and turns with it. Hence the lever (*G*) is operated on the gas cock (*E*). The flow of gas to the burners is opened full and closed partly in accordance with the position of the cam and the lever, and the flow passes through the pipe (*H*) to the point of consumption.

Fig. 6 is a form of another style of worm shaft. Fig. 7 is a design



of drop cam, in which there is a depression at (*K*) so that the cam drops into the depression as soon as the edge of the depression is reached. This gives a quick action movement to the flow of gas, which is desired in some styles of signs. Other forms of gas arc signs may be seen in use throughout the country; in fact, the outlook for the more general introduction of the signs is very good.

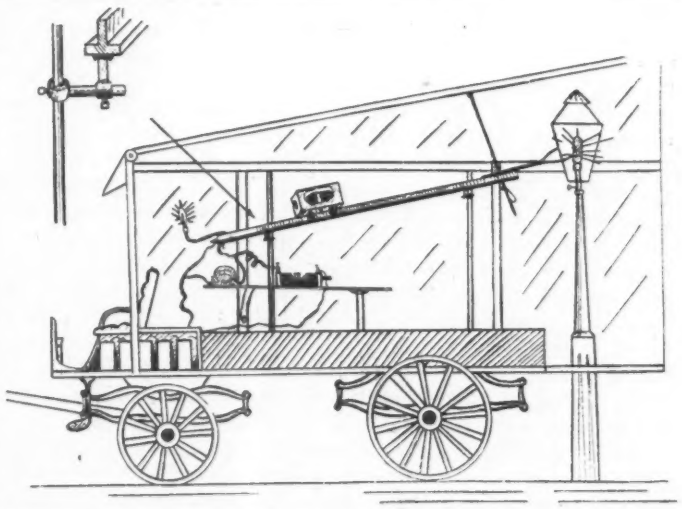
A Portable Photometer.

[Communicated by Mr. James A. Evans, to *Jour. Am. Chem. Society*.]

During the years 1901 and 1902 the writer was Gas Inspector for the city of Cleveland, O. During that time it became very urgent to know in concrete numbers what candle power the street lamps were producing, because the contract for street lighting was given on the basis of a definite candle power, with a penalty for falling below the specified standard.

The lamps were mantle burners with glass chimneys and inclosed in glass globes. They were fed by artificial gas and by gasoline. We first tried the portable photometers on the market, but they were entirely inadequate. The plan of transporting the lamps to the stationary photometer in the City Hall was tried, but the frail mantles were broken in transit and gave very erroneous results. I therefore invented the following portable photometer, which proved highly satisfactory.

A light spring wagon was secured and an adjustable top built on it. The frame was made of light steel and covered with oilcloth, which was painted a dead black on the inside, thus forming a veritable dark room. The framework extended about 4 feet beyond the back end of the wagon, the roof was hung on hinges, at the front end, while the back end could be raised during operation, to take in the street lamp. The wagon was backed up to the curb and the lamp inclosed within the extension. A black oilcloth curtain was then drawn across the back, thus completing the dark room. Within the wagon, the photometer bar rested on round steel rods which were, in turn, attached to the upright pieces of the wagon top, giving place for the operator on



the floor of the wagon. The bar was held in place by sliding set screws and could be moved out or in and up or down very conveniently and brought into perfect alignment with the light. In the front end of the wagon, under the seat, was a storage battery of 12 cells, with lead plates and dilute sulphuric acid for the electrolyte. An 8-candle power incandescent lamp was attached to the forward end of the bar and connected with the storage battery. In the circuit was a Weston voltmeter and rheostat, The lamp was standardized in the laboratory, from time to time, to find the exact voltage required to deliver exactly 8-candle power, and this voltage was held constant when at work by means of the volt meter and rheostat. The bar was of wood and carefully graduated to sixteenths of an inch. Its base served as a track for the Lummer-Brodhun sighting box to run on. The bar was 8 feet long with the electric lamp at zero. The distance from the other end of the bar to the street light was measured by means of a light stick, with a pointer at one end of it and a fork at the other, large enough to span the lamp. Each prong of the fork terminated with a ring with a wire cross-hair stretched across it. This afforded an easy and accurate means of getting the distance from the center of the mantle to the end of the bar, which, of course, varied with the different lamps.

The instrument required two men to operate it; one to adjust the bar and take the reading and the other to line up the cross hairs with the mantle and get the distance from the bar. The time required to back up to a lamp, adjust the bar, take the readings and measurements and get away was about 7 minutes. The candle power of the lamps for each night's work was figured out afterwards by means of logarithms and a table of squares.

Color Values of Artificial Lamps.[1]

By Mr. G. H. Stickney, in *Trans. Ill. Eng. Soc.*

Artificial lights differ from daylight more or less in their composition—that is, in the proportion of different colors they contain; for instance, a light may have too much red or the violet waves may not be present in sufficient quantity. On the other hand, certain artificial lights emit an excess of violet and others are exceedingly rich in yellow or green.

In all cases where the so-called "daylight balance" is not maintained the light is no longer white but the excess or absence of some particular color is noticeable not only in the color effect but in a general lack of clearness.

It is generally known that the mercury arc does not contain any appreciable amount of red. A piece of material which would reflect red rays under a white light would appear black by total absorption under the mercury light.

Yellow materials displayed in the light of the Nernst or incandescent lamps become pronounced and slight differences in pale yellow can hardly be distinguished from white, as the latter is capable of reradiating almost as much yellow light as the former. The same relation exists between green and white exhibited under the Welsbach gas or vapor hydrocarbon lights.

Direct and alternating current inclosed arcs, particularly the latter, emit an excessive amount of violet light when equipped with clear

1. Condensed from an address delivered before the New York section Illuminating Engineering Society, May 10. A number of experiments were shown, illustrating the characteristics of various lamps.

globes, so that blue and violet materials exhibited under this light are stronger than they would be in average daylight. The violet light is emitted by the arc itself, while the white light, which forms 75 to 80 per cent. of the total luminous flux, is emitted directly by the crater.

Before the inclosed arc is suitable for accurate color selection, the excess violet light must be disposed of. This can be accomplished by using opal inclosing globes and still further improvement may be made by the use of suitable reflectors coated with enamel, having a high selective absorption for violet waves. We, therefore, have at our disposal means of purifying the arc light to a high degree so that colored goods can be displayed with practically daylight effect.

Instruments for Color Comparison.—In order to bring out prominently the superiority of the arc lamp for color matching and selection, three instruments have been devised, namely, the "lumichromoscope," "photochromoscope" and "parachromoscope."

With any of these instruments a prospective buyer may compare the effects of various lights on colored fabrics and such apparatus should be of value in convincing customers that a white light is indispensable for many classes of mercantile illumination.

The lumichromoscope is probably the most practical instrument for general demonstration purposes. This apparatus is arranged so that 4 lights, say of the arc, Welsbach, Nernst and incandescent lamps, fall simultaneously on the material to be examined. Each light forms a patch 2½ inches square with a black border separating each square so as to reduce simultaneous contrast or gradation.

The lamps are arranged at such a distance that the relative intensity of the different lights falling on the material is the same, thus eliminating tint and shade effects, which take place when the intensities are of unequal strength.

The following tabulations give the effect of colored lights on aniline dyed materials and the predominating color of artificial lights in common use.

The Effect of Colored Lights on Aniline Dyed Materials.—From tests by M. Chevreul at the Gobelin Tapestry Works.—With additions by W. D'A. Ryan.

Orange	rays	falling	on	white	make it appear	orange.
"	"	"	"	red	"	reddish orange.
"	"	"	"	orange	"	deeper orange.
"	"	"	"	yellow	"	orange yellow.
"	"	"	"	green	"	dark yellow green.
"	"	"	"	blue	"	dark reddish gray.
"	"	"	"	violet	"	dark purplish gray.
"	"	"	"	black	"	brownish black.
Red	"	"	"	white	"	red.
"	"	"	"	red	"	deeper red.
"	"	"	"	orange.	"	orange red.
"	"	"	"	yellow	"	orange.
"	"	"	"	green	"	yellowish gray.
"	"	"	"	blue	"	violet.
"	"	"	"	violet	"	purple.
"	"	"	"	black	"	rusty black.
Yellow	"	"	"	white	"	yellow.
"	"	"	"	red	"	orange brown.
"	"	"	"	orange	"	orange yellow.
"	"	"	"	yellow	"	deeper yellow.
"	"	"	"	green	"	yellowish green.
"	"	"	"	blue	"	slaty gray.
"	"	"	"	violet	"	purplish gray.
"	"	"	"	black	"	olive black.
Green	"	"	"	white	"	green.
"	"	"	"	red	"	yellowish brown.
"	"	"	"	orange	"	grayish leaf green.
"	"	"	"	yellow	"	yellowish green.
"	"	"	"	green	"	deeper green.
"	"	"	"	blue	"	bluish green.
"	"	"	"	violet	"	bluish gray.
"	"	"	"	black	"	dark greenish gray.
Blue	"	"	"	white	"	blue.
"	"	"	"	red	"	purple.
"	"	"	"	orange	"	plum brown.
"	"	"	"	yellow	"	yellowish gray.
"	"	"	"	green	"	bluish green.
"	"	"	"	blue	"	deeper blue.
"	"	"	"	violet	"	deep bluish violet.
"	"	"	"	black	"	bluish black.
Violet	"	"	"	white	"	violet.
"	"	"	"	red	"	purple.
"	"	"	"	orange	"	reddish gray.
"	"	"	"	yellow	"	purplish gray.
"	"	"	"	green	"	bluish gray.
"	"	"	"	blue	"	bluish violet.
"	"	"	"	violet	"	deeper violet.
"	"	"	"	black	"	violet black.

Predominating Color of Artificial Lights.

Lamp.	Color.
Inclosed arc—clear globes	bluish white.
Inclosed arc—opal globe and selective diffuser	white.
3½ amp., 140 volt d.c. inc. arc. violet	(beyond color correction).
Nernst lamp—new glower	pale lemon yellow.
Nernst lamp—seasoned glower	deep lemon yellow.
Incandescent—new	yellow.
Incandescent—seasoned	pale orange yellow.
Welsbach and vapor hydrocarbon—new	greenish white.
Welsbach and vapor hydrocarbon—seasoned	greenish yellow.
Ordinary gas flame	reddish yellow.
Mercury arc lamp	blue green.

Intrinsic Brilliancy and Distribution.—It is generally admitted that the arc lamp is the most efficient source of artificial illumination, but, unfortunately, high efficiency generally goes hand in hand with high intrinsic brilliancy and the distribution of the arc, in common with other artificial light sources, is not by any means ideal for general interior illumination.

This objection is partly met by the use of low power lamps, taking about 300 watts. These are especially useful in low studded rooms or where there are many light intercepting objects in the area to be illuminated.

While the small units provide, possibly, a more uniform distribution, they are, unfortunately, associated with a considerable decrease in efficiency as compared with .500 to 7.0-watt lamps commonly used, to say nothing of the further disadvantage of a larger number of units to install and maintain.

With the elements of intrinsic brilliancy and distribution once properly disposed of, less weight will be given to the life of carbons and greater attention will be paid to improving the efficiency and stability of the arc by raising the current to the highest point consistent with a reasonable globe life.

There appears to be nothing on the horizon at the present time to rival the inclosed arc lamp for interior mercantile lighting, particularly where color values are important.

While the tantalum and tungsten lamps represent a marked improvement in efficiency for lamps of the incandescent class, the color has not been sufficiently changed to warrant classifying them as white lights. The magnetite and flaming arcs represent a class of efficient illuminants which unfortunately in the present forms are not particularly adapted to general interior illumination and therefore need not be considered in this instance.

The most promising immediate improvement in general lighting is through the use of high current inclosed arcs with proper diffusing devices.

Some Details of Concrete Construction.[1]

By Mr. L. J. Hotchkiss, M.W.S.E.

In concrete construction, more perhaps than in any other, development has far outrun the literature of the art, in reinforced work this is especially apparent, as new applications of this form of construction are so numerous that the ingenuity of the engineer is heavily taxed to provide economical methods of construction, and to see that no consideration of safety or good practice is overlooked. The author proposes to describe some of the methods used on recent work in the hope that the discssion may develop other methods of greater value.

In considering some of the features of concrete construction as carried out by the railroads, reference may be made to the track elevation work now going on in Chicago, in which a large amount of concrete, both plain and reinforced, is being used. In Fig. 1 is shown a typical cross section of the retaining walls being built by the C., B. and Q. Railway. This wall is but little more difficult to construct than a plain one, while the yardage is much less. Except where inclined walls are required for approaches to team tracks, the tops of all walls are at the same elevation, and that part of the cross section above the angle in the back of the wall is retained throughout. Changes in height are made entirely below this angle, the elevation of the footing varying in horizontal steps, thus maintaining the bearing surface normal to the direction of pressure, and facilitating the use of sectional forms, which will be illustrated later. Plain abutments are used in connection with these retaining walls, the footings having a reinforced projection in front to increase the bearing area.

This type of abutments was used in preference to reinforced ones, because of difficulties in constructing the latter. All footings and the lower part of the abutments were built before any of the tracks were

1. "Journal Western Society of Engineers."

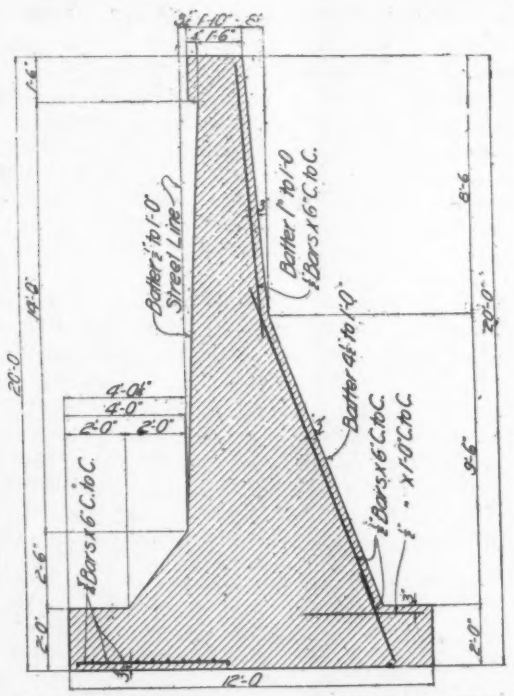
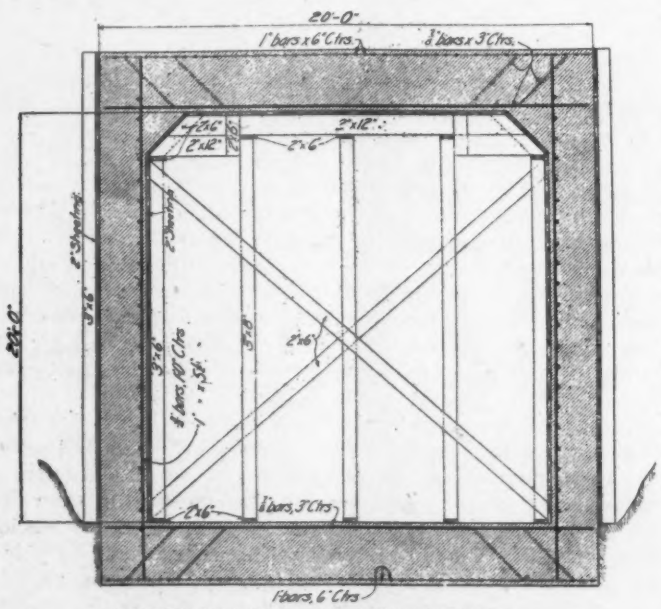


FIG. 1 TYPICAL CROSS SECTION OF TRACK ELEVATION RETAINING WALL. C.B.& Q.RY.

raised, the abutments being completed after the tracks had been elevated on temporary bridges. Reinforced abutments could not have been readily built in this manner.

Each track is to be carried over the subways on four spans of reinforced concrete deck girders, resting on the abutments and on three lines of steel columns and cross girders. The sidewalk girders are 10 feet 9 inches long and 17 inches think, and the street girders are 24 feet 3 inches long and 33 inches thick. The girders are built in sections about 7 feet wide, two sections being required for each track. There are to be 15 subways and the number of tracks carried will vary from 6 at Blue Island avenue to 42 at Robey street. Such a large number of girders, or "slabs" as they are called on the work, is required that a special yard was established for their manufacture.

This road is also doing a large amount of concrete construction outside of Chicago. Rectangular boxes form an important part of it. A cross section of one of them with the forms in place is shown in Fig. 2.



SECTION OF FORMS AND BOX CULVERT.

FIG. 2.

They are used for culverts, cattle passes and subways, and are built to any length and under any embankment. They range in size from single 4 by 4 feet to double 20 by 20 feet and triple 16 by 20 feet boxes. They have many advantages over arches, being far more simple both in design and construction. The form work is of the plainest kind. No piles are needed under them, and they may be placed on any kind of ground material, whether soft mud, quicksand or gravel. Where a rock foundation is available an arch is the cheaper form of construction. But in any location requiring piles the comparison is the other way. The massive abutments required to give stability to an arch, cover an area well outside the clear opening, and place upon the piles the weight of a mass of earth which, if a box culvert were used, would fall entirely outside the structure. The pits to be excavated for the arch exceed in breadth, depth and yardage, those required for a rectangular box. Where the material to be excavated is sand or soft mud, the single item of depth of foundation required, will make a large difference in the cost of sheeting and pumping. Where a structure is to be built under a track in service, the temporary opening required for a box culvert is but a few feet more than the clear span of the completed work, while for an arch the length of the temporary bridge must be increased to clear the abutments. Because of this difference a small box culvert can often be built between the bents of an existing pile bridge without in any way disturbing the latter, while if the arch were used one or more bents would have to be replaced by a temporary steel bridge. A large number of these boxes have been built by the C., B. and Q. Railway, and not one of them has failed to give satisfaction.

In Fig. 3 are shown the forms used on the retaining walls previously

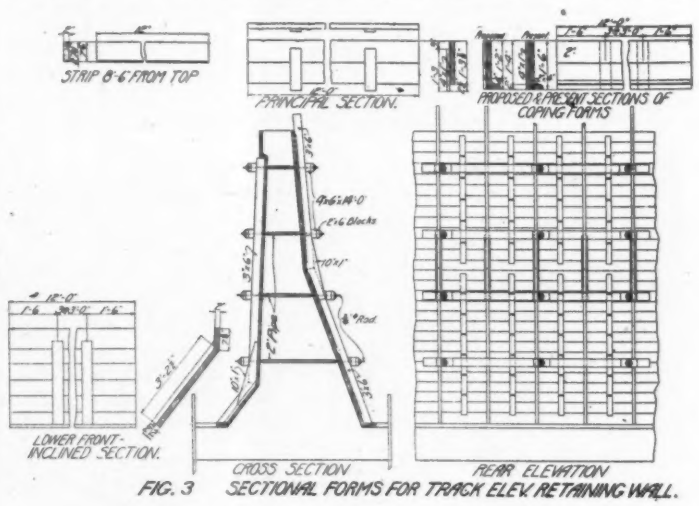


FIG. 3 SECTIONAL FORMS FOR TRACK ELEV. RETAINING WALL.

referred to. They are a combination of continuous and sectional forms; the sectional part consisting of studs, coping and bottom forms for the face and sectional forms for the back of the wall. Ordinary sheeting is used between the coping and bottom forms, the back forming being entirely sectional. All sections are made in templates and delivered on the work in units, as shown in the figure. No attempt was made to use sectional forms on the face of the wall, except as mentioned, because the sections become battered and warped with use, do not fit closely together, and leave the wall rough when they are removed.

In Fig. 4 is shown the method of bracing and tying down the forms.

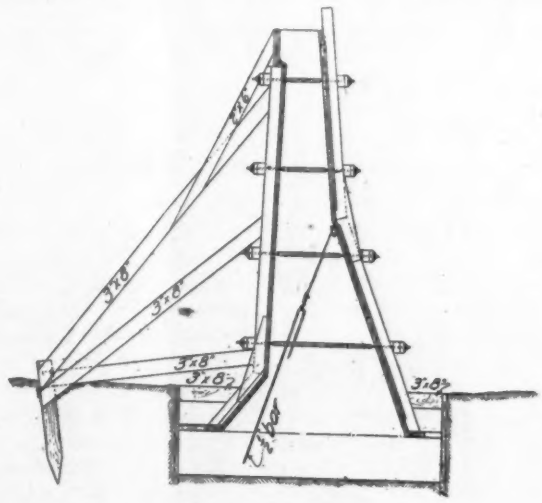


FIG. 4 FORM BRACING

The cross section of the wall is such that the wet gravel concrete used had a tendency to lift the forms off the footing. This did occur in one case, causing considerable trouble. The plan shown in the illustration was then adopted, the bars being placed in the footing and the forms tied to them with wires. In building such walls it is difficult to keep them in perfect alignment. Small variations in the face of the wall are not noticeable, but any deflection of the coping shows at a glance. The method of bracing the coping form shown in Fig. 4 furnished an easy and effective way of lining up that form.

In Fig. 5 is shown the forms used for building the deck girders or

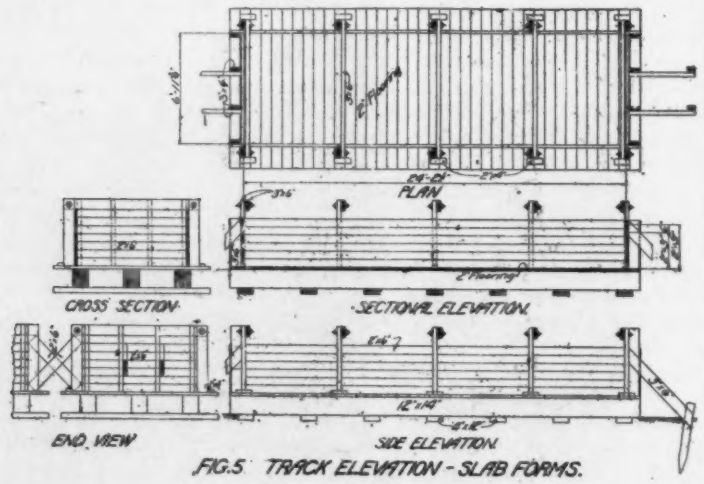


FIG. 5 TRACK ELEVATION - SLAB FORMS.

slabs for the subways, this form being for one of the street slabs. These slabs are very heavy, weighing 35 tons each, and it was necessary that a good foundation be found for them. At Morton Park a large bed of cinders several feet deep was available. This was levelled off and the forms built there, the timbers supporting the forms being carefully tamped and levelled. Each side and each end form was complete in itself. They were set to templates laid on the floor of the box, as only ¼ inch clearance is allowed for each slab and were used many times. One hundred floors were provided, and when they were all filled with concrete the slabs first built were sufficiently seasoned to be piled up and thus permit using the floors again.

In Fig. 6 is shown one of the abutments which the C., B. and Q.

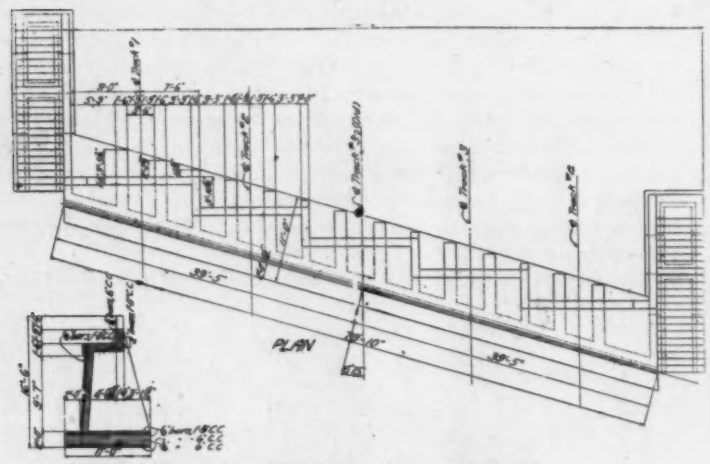


FIG. 6 - EAST ABUTMENT 48th AVE.

Railway built for a special subway at Forty-eighth avenue, Hawthorne. After the footing had been constructed, boxes having three sides and a roof were built between each pair of buttresses. These boxes formed back forms for the curtain wall, side forms for the buttresses and bottom forms for the bridge seats. They were very expensive on the first abutment, as all sheeting was placed horizontally and cut carefully to fit. On the second abutment most of the sheeting was placed vertically, and as little cutting as possible done, the result being a large saving in the cost of form work.

In fastening wall forms together the use of bolts or rods instead of wires increases the efficiency of the forms and does not increase the cost. On the work described here pieces of scrap pipe were cut to fit loosely between the forms and the rods passed through them and removed after completion of the work. The ends of the pipes were stuffed with waste to keep the grout from filling them. Small blocks of wood placed between the form and the ends of the pipes have also been used for the same purpose, the blocks being later removed and the holes filled with mortar. Neither plan is entirely effective, and the pipes sometimes fill with grout, making it difficult to pull out the rods. The rods and pipes cost but little more than wire and the labor of placing them is materially less. The wires always stretch a certain amount, and frequently break, permitting the forms to spread. If bolts are used the forms can be filled with wet concrete to a depth of 15 or 20 feet without danger.

Forms should be coated with some substance to close the pores in the wood. The finish of the concrete is improved and the lumber is left in better shape to use again, as less concrete sticks to it. Soft soap thinned with water and applied with a whitewash brush or a broom works well for this purpose. Some drilling and lubricating compounds and black oil have also been used. They are greasy and do not dry quickly, and in this respect are better than soap.

The careful placing of bars is one of the most important features of reinforced concrete work, and one which is too frequently neglected because of the expense of doing it right. A method of placing them in the inverts of boxes is shown Fig. 7, which is both simple and

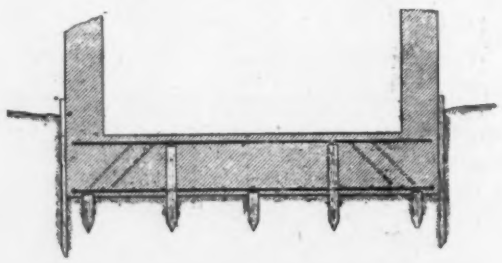


FIG. 7-METHOD OF SUPPORTING BARS.

effective. It applies equally well to wall footings. The stakes can be of any convenient size, 2 by 2 inches being sufficient. Their spacing depends upon the weight of bars to be carried. It need not be less than 6-foot centers and can often be more. The longitudinal bars are secured to the stakes by wire nails bent over the bars. The bars are tied together at their intersections with small, soft wire, such as stovepipe wire. If a convenient clip applicable to all sizes of bars could be devised, it would be a welcome substitute for the wires, as this part of the work is slow and expensive, and must be thoroughly done, where the concrete is placed in large batches, especially if it is dropped several feet into the pit. Where a wet gravel concrete is used, the need of secure fastening for the bars is particularly great. Such a concrete flows easily, and if bars are merely laid in place they will be swept aside as though they were chips. The vertical bars in walls may be carried on longitudinal timbers supported over the footing. They can be fastened with wire nails, and ordinarily only one line of supports is required, as the bars can be thrust into the concrete after the pit is partly filled, thus making the concrete assist in holding them. The longitudinal bars should be wired to the vertical ones if accurate spacing is desired. In thin walls this must be done before the forms are completed, because of the limited working space. In the roofs of boxes the bars can be supported in a manner similar to that used in inverts, the iron supports shown in Fig. 8 replacing the stakes. Small blocks of concrete cast with notches to retain the bars are also used for this purpose.

For general use concrete mixed wet is better than a dry mixture. If good gravel is obtainable it is to be preferred to crushed stone. A wet gravel concrete can be handled much more cheaply than stone concrete, and gives as good results. It dumps easily from cars or buckets, can be placed in the forms with little labor, and requires no tamping. A derrick can serve a larger area from one position with such a mixture than if dry concrete is used, for the wet gravel concrete will flow in chutes placed at an angle so flat that dry concrete or even a wet stone concrete will not move in them.

In the construction of walls it is best to avoid longitudinal joints wherever possible. If a section of wall is partially filled, and the concrete allowed to stand for some time, it is difficult to remove all the "laitance," and in thin reinforced walls this work is difficult at any time. If it is not thoroughly done, an unsightly joint results, and one through which seepage will occur with consequent discoloration

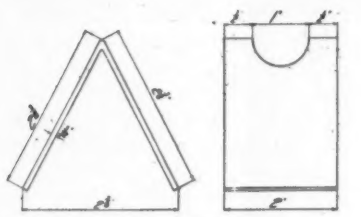


FIG. 8-CORRUGATED BAR SUPPORT.

of the surface. Where the nature of the work will permit, vertical bulkheads can be built at convenient intervals, and the space between filled without stopping. More bolts must be used to tie the forms together than if the concrete were placed in layers, but otherwise the forms need not be heavier than would ordinarily be used. The concrete can be placed more economically, as less moving of equipment is required. The vertical joints are less conspicuous than horizontal ones. In plain walls they also serve as contraction joints, and if a triangular moulding is placed in them the resulting grooves relieve the monotony of the surface and conceal the opening of the joints from contraction of the wall. The use of vertical tenons in these joints is of little value, as the tenons quickly crack in the plane of the joints. A small percentage of longitudinal reinforcement will do the work of the tenons and also prevent contraction cracks.

Similarly, in building the inverts and roofs of boxes and footings for retaining walls, vertical bulkheads should be erected parallel to the tension rods, and the space between filled continuously. When quick setting cement is used in hot weather, care must be taken that these sections are not too long. In one case observed last summer, a section of the roof of a box equal to a day's work had been bulk-headed off. One end of the section was filled half full, and while the other end was being filled the concrete first placed became so hard a man could walk on it without making an impression. This made a joint in a horizontal plane, which should not be permitted in any beam.

Occasions will arise, however, where a longitudinal joint in a wall is necessary, and where this is the case the thorough cleaning of the concrete is often neglected. The laitance is not all removed and dirt, shavings and sawdust are permitted to remain in the forms. This work cannot be left entirely to laborers but must have efficient supervision and inspection. The surface of the concrete should be scrubbed with wire brushes and water until every stone shows clearly, and the water used in the scrubbing should be flushed off and not left standing in the forms with the laitance in suspension, to be deposited on the concrete again as soon as the scrubbing gang has gone. Both time and expense can be saved if the cleaning is done before the concrete becomes hard. It can be done with shovels and a small amount of washing instead of the protracted scrubbing necessary later. The bond obtained in even the most carefully cleaned joint is of uncertain strength, and if the cleaning is poorly done there is no bond at all.

For small jobs where it does not pay to install a power machine a hand power mixer mounted on a frame carried on two large wheels is used by the C., B. and Q. Railway. This machine is turned by a crank driving a sprocket chain. It is charged at the material piles, turned and hauled to the work to be discharged into the forms, and is fairly satisfactory. It requires much turning and the men are apt to become careless and dump it before mixing is completed, but, with careful supervision, good work can be secured. The mixer is at least as efficient as hand work, is more convenient and easier on the men.

[To be Continued.]

MR. STANLEY J. LOWE, for many years in the counting rooms of the Chattanooga (Tenn.) Gas Company, has resigned in order to accept a responsible position with the large local concern known as the Tom. Fritts Hardware Company.

Graphical Method of Determining Power Factor from Wattmeter Readings.

By MR. A. A. RADTKE, in *Elec. World.*

When two wattmeters are connected to indicate the power in a 3-phase circuit, the two indications are respectively:

$$W = e\,a\,\cos\Theta$$
$$W_1 = e_1\,a_1\,\cos\Theta_1$$

Now, when the circuit is balanced e and e_1 are equal, and likewise a and a_1 are arithmetically equal; hence,

$$\frac{W}{W_1} = \frac{\cos\Theta}{\cos\Theta_1}$$

and $$\Theta = \phi - a$$

and $$\Theta_1 = \phi + a$$

The equation then reads:

$$\frac{W}{W_1} = \frac{\cos(\phi - a)}{\cos(\Phi + a)}$$

which can be transformed to

$$\frac{1 + \tan\phi\,\tan\,a}{1 - \tan\phi\,\tan\,a}$$

Since alpha equals 30°, $\tan = \frac{1}{\sqrt{3}}$

Then solving this expression for tan Φ gives the well known form

$$\tan\Phi = \frac{W - W_1}{.577\,(W + W_1)}$$

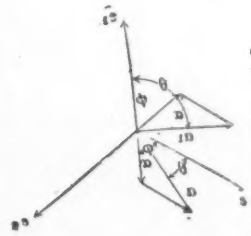


Fig. 1.—Vector Diagram.

In order to interpret this expression graphically we resort to a construction shown in Fig. 2. Let the two ordinates of the point D, AD and DC, represent in magnitude the two readings of the meters. Now, with D as a center lay off from the point D, CD on the line AD, locating the point H and the point K on the same line extended. The line AH then represents the numerator of our equation $W - W_1$; and the line AK represents that

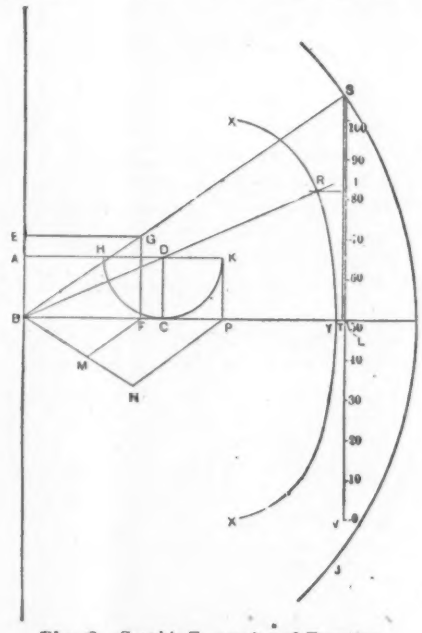


Fig. 2.—Graphic Expression of Equation.

portion of the dominator within the brackets $W + W_1$. In order now to represent .577 $(W + W_1)$ we lay off the line BN and let it represent unit length and on it locate the point M at a distance .577 from B to N. Connect NP and draw the line MF parallel to NP. The line BF then represents in magnitude the denominator of the equation .577 $(W + W_1)$. Then laying off AH on the vertical axis, locating the point E, and completing the parallelogram $BEGF$, we can now draw the diagonal BGS, which defines the angle of lag, WBS.

The cosine of the angle can now readily be determined. Draw the arc of a circle SWJ with B as its center and consider the radius as unity. Where the line BG extended intersects the arc of the circle,

drop the perpendicular *ST* to the horizontal axis. The line *BT* then represents the cosine of the angle of lag for the condition represented by the two wattmeter readings.

Where it is desirable to read at once the angle of lag, knowing the readings of the wattmeters, a curve *XYX* can be drawn following the direction before given, by laying off the lengths of the lines *BT* from the point *V* vertically and projecting their upper ends horizontally until they meet the diagonals of the parallelograms formed from the individual wattmeter readings; for example, *BDR*, and drawing through these points a curve, as shown. When the curve is once constructed it is only necessary to draw the parallelogram representing the two wattmeter readings and then, by extending the diagonal until it intersects the curve *XYX*, the power factor can be at once read opposite its horizontal projection upon the vertical scale *SLV*.

From this curve it is at once clear that when the angle of lag is 60°, the power factor is 50, and one of the wattmeters reads the total power likewise, when the angle of lag is 0° the two wattmeters read equal and the power factor is unity.

The Sale of Gas.

[A paper read by Mr. F. W. Goodenough, London, at the last meeting of the Institution of Gas Engineers.]

A few years ago the title of this paper would undoubtedly have caused many engineers to wonder what in the world the author could have to say, and why there should be any need to talk about the selling of gas. That was in the days when the maxim that "Dividends are earned in the retort house" passed unchallenged, save by the occasional man who realized the danger of that as of most other maxims, few of which can be adopted without qualification, as they generally attain forcefulness of expression by exaggerating one aspect of a question to the exclusion of all other. Most of the sayings that pass current as epitomes of wisdom need to be taken as subject to all sorts of limitations, conditions and exceptions; and of none is this more true than of the particular dictum quoted above.

The writer thinks it will not be denied that, partly misled by this maxim, and partly because they unfortunately failed to realize that monopoly is not the safest and soundest foundation on which to rely solely, or even mainly, for the stability of a business, many gas managers for far too many years - long, indeed, after the enemy was at the gate—considered that practically their sole concern was to make, as skilfully and economically as possible, the quantity of gas that the public thought fit to consume. There was no regard as to whether the gas so consumed represented the total gas consuming possibilities of the district, or whether it was used in the most economical and satisfactory manner; and no attempt was made to inform the public as to all the various ways in which they could consume gas to their own—and to the gas manufacturer's—advantage. "Take it or leave it; but if you take it, pay for it first," was the more or less plainly expressed attitude of many gas undertakings towards those who desired to avail themselves of the "privilege" of being supplied with gas.

There were, of course, always men in the gas industry who did not believe that carbonizing was the beginning and ending of their work, nor that a high and mighty attitude was either wise or becoming in a business undertaking having received special privileges at the hands of the public it was designed to serve. The hands of most of these enlightened ones, were, however, to a greater or less extent, tied by Boards and Committees, who could not take a long sighted view of policy - and, if all that is sometimes heard be true, there are still more than a few short sighted Boards and Committees to be found administering gas undertakings in the British Islands. On the whole, however, it is as true of our industry, as of others, that "Times change, and we with time;" and, happily, under the healthy stimulus of competition, the old cast iron methods and uncommercial idea are less general than formerly in the gas industry; and to-day it is widely, if not perhaps widely enough, recognized that the sale of gas is as much a trade as is the sale of provisions, clothing, or any other article of general and everyday use, and that to the selling of it must be brought the elementary principles of commerce.

Elementary Commercial Principles.—These principles may be said to comprise the determination to sell to as many people as possible as much as possible of an article of a carefully maintained quality calculated to give the greatest possible satisfaction, and, throughout the whole business of selling, to treat the buyers in a straightforward, considerate, and courteous manner, showing that their custom is appreciated, and that the seller's desire is to deal fairly and honorably with them, giving them good value for their money.

The putting of these principles into practice is by no means so easy a matter as to enunciate them when the seller is - not an individual having personal knowledge of every transaction that takes place with his customers, but—a big organization having to transact its business through a large number of officials, some of whom may be tempted to assume the airs and perpetrate the crimes of "Jacks-in-office." Indeed, this, in common with the impossibility of maintaining direct personal relations between master and servant, is one of the very real drawbacks incidental to the substitution of the corporate for the individual trader. The average civility and attention with which one is treated by the counter hands in some of our big London "stores" is considerably below that received from the small tradesman serving behind his own counter. There is, however, much truth in the old saying—"Like master, like man;" and if the head officials of a gas company are animated by the right spirit, and take care constantly to expound the principles of fair business dealings to their subordinates, the leaven will in time work wonders in the general body of the staff - to the great ultimate advantage of the undertaking, and, consequently, of its staff. The author might mention that the following notice occupies a prominent position in all the Gas Light and Coke Company's Inspectors' Offices:

Every Officer and Workman in the Department is enjoined to remember at all times that the policy of the Company is to give prompt attention and complete satisfaction to every customer, so far as that can possibly be done without prejudice to the best interests of the Company and its other customers. It is the customers' money that pays our salaries and wages.

The following are extracts from the rules which are handed to every man employed in the Inspectors' (or "Sale of Gas") Department:

Let every man realize - as, happily, most of the Company's men do realize—that the Company's prosperity depends upon the thorough satisfaction of their consumers, and that his prosperity depends on that of the Company. Men who do not realize and act upon these facts are not wanted. Men who do, will find the Company a good friend. * * * * * * * * * * * *

Occasionally, the Company's workmen have to deal with consumers inclined to be unreasonable, ill-tempered, or even abusive, especially in cases of disconnection of supply for non-payment. Particular care must always be taken to show every possible courtesy and forbearance towards such consumers, and to avoid loss of temper, the display of any personal feeling, or the resentment of abuse—which, it should be remembered, only reflects upon him who resorts to its use.

Where itis found that a consumer has, without apparent reason, a grievance or prejudice against the Company, courtesy and discretion on the part of their servants may often discover and secure the removal of the cause of such grievance or prejudice. In any discussion with a consumer, speaking loudly or excitably should always be avoided. A quiet, confident, and respectful manner carries more weight than any amount of bluster, which only irritates and offends.

The "Sale of Gas" Department.—It will be observed that the writer has referred to the "Inspectors' Department" and the "Sale of Gas Department" as being interchangeable terms; and this is, in his opinion, as it should be. He does not think that the best results in the direction of increasing the sale of gas can be obtained if that side of the business is separated from the routine work of the outdoor staff and entrusted to a special canvassing staff. If an inspector is not competent to do his own canvassing, he is not qualified to occupy his position; for just the same qualifications are essential in the man who has to represent his undertaking in discussions with customers arising out of applications and complaints of all descriptions, or in the settlement of disputes as to the quantity of gas charged for, etc., as are required by the man whose business it is to persuade existing consumers to extend their use of gas, or those to become customers who are not so already.

The Qualifications of a Gas Salesman.—These qualifications comprise: Informed intelligence, a courteous manner, a good temper, and, above all, tact. The last-named is one of those things which, like "good taste," elude definition. Mr. John Morley once said, in regard to definitions, "I can't define an elephant; but I know one when I see one." So one may say one cannot define tact; but one knows it when one encounters it. Possibly the nearest approach to a definition is to say that tact is the gift of seeing and appreciating the points of view and the feelings of those with whom we are dealing, and doing all in our power to consider those feelings and to meet those views in a reasonable spirit. This it will be agreed, is essential in every officer of any business concern who has dealings, whether as salesman, as collector, or as head official, with its customers; and how much more so in the officers of a company having a statutory monoply (that dog-hanging name) or of a municipal undertaking, handicapped

as to popularity by its close connection with that most unpopular of creatures—the rate collector.

Since, then, it is necessary that the inspector should possess the qualifications essential in the canvasser, is it not obviously better economy, and certain of producing better results, to combine the two offices in one? For the inspector naturally gets the best of opportunities for canvassing work. He is generally the first representative of his concern to make the would-be customer's acquaintance; he has to arrange for the meter and service; and, as a rule, he is requested to meet the customer on the premises to take instructions. What better opportunity for suggesting the use of gas for other purposes than those originally contemplated by the customer? The customer takes up residence, let us say, in the spring, and is induced to install a gas cooker, but won't talk about gas fires. Later in the year he complains of some defect in the cooker; the inspector (already known to the customer, which is a material point gained) calls, is able possibly to explain that there is no defect - it is merely a question of the servant keeping the stove clean—gives some good advice respecting its use, and has found in the course of conversation just the opportunity he wanted to canvass for the installation of gas fires, and for the maintenance of the consumer's incandescent burners.

Or, again, the inspector, if he is responsible for the canvassing of his district, will often, when reading the meter at the quarter, take advantage of the opportunity thus naturally afforded him to introduce additional gas appliances, to talk about the relative cost of gas and electricity, or to induce the occupier of another portion of the premises to become a consumer. In short, the inspector finds many natural opportunities, and can make many others, for seeing the customers in his district, and then canvassing them "by the way;" whereas a canvasser who is only a canvasser frequently cannot get beyond the doorstep—at any rate, in London, where canvassing pure and simple has been done to death.

The Organization of the Sales Department.—The best system, therefore, in the author's opinion—one which has been found to work excellently well in the case of the Company with which he is connected—is to divide up the area of supply into districts (the Gas Light and Coke Company have 75 districts, containing about 225,000 customers supplied through ordinary meters, and 260,000 supplied through pre-payment meters) and to appoint an inspector for each district, to make him responsible for pushing the sale of gas therein, and to reward him annually according to the results achieved, considered in relation to the posibilities of his particular district. A monthly report as to the special work done to further the sale of gas, a quarterly return of all the statistics relating to the district, and (most important of all) a personal knowledge of each man, form an adequate basis for determining annually the reward (if any) to be granted; and a bonus each year, awarded (or withheld) on merit only, has been found an excellent stimulus to zeal and energy.

This, it must be said, is not due merely to the cash payment regarded only as cash; it is largely due to the fact that such cash payment is a token of the management's appreciation of good work done. There is more virtue—there is indeed more cash value to the employer, to put the matter in its barest form—in the encouragement and generous appreciation of service well and faithfully performed than many people realize. One of the esential qualities of a leader of men is that he should be ungrudging (while always carefully discriminating) in the praise of subordinates. The old sage was surely right when he said that "'Tis a great sign of mediocrity to be always reserved in praise."

In addition to the district representatives, it is desirable in any large undertaking to have one or two special representatives for looking after and canvassing large firms, especially those having many branch establishments; while, of course, the head of the organization must be prepared to tackle many of the big people himself, and to deal with public lighting authorities, especially keeping his eye on the manœuvers of municipal electric light departments, of which, in the writer's district, there are no less than ten. He should endeavor to become personally acquainted with all his principal customers. The personal factor is one not to be despised in business, and an important customer will often come readily to terms or discuss matters amicably with an official he knows and trusts, when he would take up an aggressive line with one who was to him only the representative of a soulless and conscienceless corporation.

Reference has been made to "the head of the organization;" and the author considers it essential in every gas undertaking of any magnitude to have a chief official specially appointed to superintend the sale side of the business. Few engineers having charge of works of fair size can find the time, even if they have the inclination, the aptitude, and the requisite specialized knowledge, to push, in the live, persistent and untiring manner that is so necessary, the sale of the gas they have to manufacture. Where, as in most cases, the engineer is also the manager, he will naturally organize and generally direct the commercial policy of his undertaking. But it must be next to impossible for him to devote an adequate amount of time to the all-the-year-round work that is called for; and a special gas salesman has become one of the essentials of every considerable undertaking wishing to keep in the front rank.

The making full use of such opportunities as have been mentioned as coming to and being made by the inspector—or district representative, as he might more correctly be described—in the daily round of his duties, while capable of producing much good fruit in the way of increased sales of gas, by no means exhausts the means of achieving that end. In order that the system of district representatives indicated may be as fruitful as possible, several conditions are essential.

Conditions Essential to the Success of a Forward Policy.—In the first place, the whole business policy of the undertaking—its attitude to the public it has to serve—must be an enlightened one. The undertaking must not be merely a gas supply business; it must be a gas service business. That is to say, it must be willing and anxious to undertake every service for the consumer necessary to secure that the gas bought shall be used to the best advantage, and that the using of gas shall be attended by the least possible trouble to the user.

The policy of its gas sale department must be one of prompt, courteous, and skilful attention to the requirements of its customers and of conciliatory treatment of all complaints, which, when unfounded, are generally due to misapprehension, are rarely made from a desire to give trouble, and should never lead to the complaining consumer being regarded as a nuisance, but rather as a person to be converted into a satisfied, and therefore more ready, user of gas. The public as a body are very reasonable; and even an unreasonable man finds it difficult to be so if the undertaking's representative persists in regarding him as one who only desires what is just and fair.

The policy of the collecting department (which should be in the closest co-operation, if not actually amalgamated, with the sales department) must also be animated by the spirit of consideration and conciliation; so that the customers may at all times feel that they are being dealt with justly and considerately, and that the powers of a monopoly are not being unduly brought to bear upon them. To give an illustration of the sort of question between supplier and consumer that lends itself to conciliatory treatment. Many gas managers have had cases occur in their districts in which a consumer's account has been greatly increased through an escape on the internal fittings which has not been noticed for some time owing to the gas getting away into the open air. The consumer is, of course, liable for the gas wasted; but why should the gas company desire to benefit by his misfortune? The gas has only cost them the coal and the bare manufacturing charges—why should they ask for profit on what the consumer never wished to buy and has made no use of? If this view be taken, and the consumer only asked to pay for (say) half the wasted gas at the selling price, the supplier will be covered and the consumer fully satisfied with the equitable treatment he has received.

All correspondence with consumers must be carried on in a friendly and accommodating, instead of harsh and stiff backed spirit. The writer should always remember, moreover, that the reader can only read what is written, and that it is therefore essential that he, the writer, should take care to exactly express his meaning and attitude, and not give rise to misunderstanding or friction by failing to let the spirit which animates him appear in the written word. It is the fact that correspondence so often fails to convey to one party the actual feelings and attitude of the other that makes it desirable to deal with consumers in person rather than by correspondence. A conversation of 5 minutes will often do more good than twice that number of letters. The letter writing habit is one to be carefully guarded against.

It should also be constantly borne in mind, in dealing with consumers, either personally or by letter, that the consumer only understands with the understanding and knowledge of an outsider—that he does not know the whys and wherefores of the rules laid down by a gas undertaking to govern its relations with its consumers, and usually views them with suspicion. It is therefore necessary for an officer of a gas undertaking always first of all to try and realize how any question that has arisen would appear to him if he were a consumer having no inside knowledge as to gas administration, and so to appreciate the consumer's point of view and probable feelings. It is then far easier to explain matters to the consumer's satisfaction, to

remove misapprehensions, and to create a friend who believes in the equity of your administration out of one who formerly regarded it with suspicion and dissatisfaction.

If these fundamental conditions concerning the relations of the undertaking and its customers do not exist, then the efforts of the most active district representative may easily be rendered of no avail.

In the second place, the staff of the sales department must be well instructed in all the details of their business, and the workmen employed must be skilled in their duties and have a sound practical knowledge of all the various gas appliances they are called upon to handle.

In the third place, the personal efforts of the staff must be supported and supplemented by judicious and persistent advertising, not only in the Press, but by circulars and pamphlets of suitable character.

It will perhaps be worth while to consider in greater detail some points arising out of the three groups of conditions that have been mentioned.

I.—The Services which a Gas Supply Undertaking may Advantageously Perform for its Customers.

These comprise:

(1) *The Supplying and Fixing of Lamps, Fittings, Cookers, Fires, Engines and every other Kind of Apparatus for the Use of Gas.*

No canvassing will do much good if the customer has to be referred to a third party for the goods he is solicited to purchase or hire, or for the execution of the work entailed in the fixing of them. Every gas manager would, of course, rather have such work—with the exception, perhaps, of the fixing of gas engines—done under the supervision of his own staff, and know that it has been carried out by men specially trained for the purpose, than run the risk of the apparatus being discredited because of its having been improperly or unsatisfactorily fixed.

Hire and Hire-Purchase of Gas Appliances.—The sale of fittings, stoves, and apparatus of all kinds on the extended payment system is undoubtedly of great value in developing the sale of gas; while the hiring out of cookers and fires is now so general, and has done so much to popularize the use of gas for fuel, that the barest mention of the system will suffice here, though it must be confessed that the author has been astonished to hear of so many gas undertakings still lagging behind on the question of letting fires on hire.

Gas fires do not result in such large consumptions, taking the year through, as do gas cookers; but the consumptions are very good and acceptable. So that, provided the rents charged are adequate to cover interest, depreciation, repairs and exchanges, it is somewhat difficult to discover any sound argument whatever against letting gas fires on hire, and endeavoring to get them fixed in every bedroom and "occasional" room, if not in every other room, in every house. There is one indirect advantage that has grown from the hiring out of gas fires that may not have occurred to some, and that is that the success of this system has led those in the electrical industry—thinking that what is good for the gas industry must be good for them—into wasting their energies and resources in pushing electricity for heating at a price which, considering the poorness of the load factor and the frequent coincidence of the heating and the lighting loads, is considerably below cost. They are thus weakening themselves for meeting our competition in the lighting and power fields. It has been found that the poor heating result obtained from electric radiators at considerable cost, coupled with the fact that the ventilation of rooms in which they are used is seriously impaired as a consequence, have proved in many cases a good advertisement for the advantages of gas for heating.

Fixing Gas Fires.—It must not be forgotten, however, that the *crux* of the gas fire business is the fixing. If this is not done with intelligent care in regard to the arrangement of the fireclay, and to the fixing of the flue, with careful consideration of the local conditions as to chimney draught, and in such a manner as will insure the fire working silently and without smell, and will prevent, as far as possible, wasteful usage of gas, then the gas fire business will not be one-half, not one-tenth, as successful as it might be. No trouble should be spared in the training of fitters and their supervisors in the satisfactory fixing of gas fires. The author must not, however, digress into the many points arising out of the service of supplying and fixing gas apparatus, or his paper would reach dimensions far exceeding reasonable limits.

The Show Room.—A well equipped show room is a necessary adjunct to the sale of gas branch of the business. Such a show room should be attractive in appearance, both within and without, and should contain samples of all classes of gas apparatus fitted up ready for the demonstration of their uses and advantages. The man in charge of the show room must be well versed in every branch of the gas supply business, be prompt, courteous and ready in his explanations to customers, but must not have the fatal defects in a salesman of talking too much and too glibly, or endeavoring to persuade a customer that he knows what the customer wants better than he does himself. Like poets, good salesmen are born, not made; and fortunate is the manager who secures the right man for the post.

Co-Operation with Ironmongers.—The undertaking of all branches of work for its customers and the establishment of a good show room need not prevent a gas gas undertaking from entering into a friendly and mutually advantageous agreement with the ironmongers of the town, whereby they have an inducement held out to them to utilize their opportunities for introducing gas apparatus to their customers. The Gas Light and Coke Company started such a system in their district last autumn, and the really enterprising ironmongers are beginning to benefit decidedly by its introduction; while others do very little business, and blame the Company, who, they say, are too quick in capturing business to give them a chance. Such is always the excuse of the slow mover, who fails to see that his contention is double-edged. If, of course, the ironmongers expect that enterprising gas undertakings are goning to surrender bodily to their trade the business of supplying gas appliances, they are bound to be disappointed, because it has been, and is, the gas undertakings who have created, and are fostering, the gas stove trade, and who have conducted, and are conducting, the fight against the competition of the electric light, with the result that they are reaping the reward of their enterprise, and have no intention of letting their business drift again into the backwaters where the ironmongers left it. Moreover, a large section of the public have learned to look to them for the supply of gas apparatus, and would now resent a refusal to meet their wants. But there is plenty of room still for the enterprising ironmonger to profit by, and stimulate, the demand created by, and at the cost of, the gas industry; and the gas industry may advisedly welcome, facilitate, and offer concessions in exchange for, their co-operation.

The next service which a progressive gas undertaking must be prepared to perform for its customers is:

(2) *The Maintenance of Mantles.*

As to this, little need be said at this time of day, as it is now very generally recognized by gas managers that maintenance is the very essence of incandescent gas lighting. The Gas Light and Coke Company are now maintaining about 200,000 burners; and the writer would like to see the number very greatly increased. It is only quite rarely that one comes across a consumer who is able to maintain his burners in really efficient order. They are generally only attended to when they have obviously gone wrong and somebody grumbles. In large business houses, it is often the "handy man" who has to look after the burners; and everyone knows the handy man. He is competent to do all sorts of work—except the particular sort that he happens to be required to do.

The Use of Uncollodionized Mantles.—The only point, perhaps, which may be of interest to mention specially in regard to the maintenance of mantles, is that managers having a large number of burners to maintain might well turn their attention to the adoption of non-collodionized mantles, which are so generally used on the Continent. It has been found that there are material advantages accruing from the substitution of the non-collodionized for the ordinary type of mantle; and the writer's Company are now burning off and using about 250,000 uncollodionized mantles a year. Possibly details in regard to the system would prove interesting to the Institution on a future occasion.

Another of the services that has been undertaken for the consumer within the author's experience, with gratifying results, is:

(3) *The Domiciliary Instruction of Consumers or their Servants in the Economical Use of the Gas Cooker.*

It having been found by experience that very many consumers who were employing gas for cooking in the district of the Gas Light and Coke Company did not understand how to use their stoves so as to get the best results for the smallest possible consumption of gas, and were consequently in many cases not using their stoves regularly and for all purposes, were not fully satisfied with gas as a cooking agent, and were therefore not such advertisers of the system as are those who thoroughly understand the use, and so enjoy all the advantages, of the gas cooker, the Directors decided to provide lady instructors, skilled in the use of cooking stoves, to attend at consumers' houses

free of charge. At first the plan was tried of notifying every consumer for whom a cooker was fixed that a demonstrator would be sent to explain its use to the lady of the house or her servants, if desired. But only one consumer in ten responded; the remainder evidently not realizing their need of instruction.

In the cases, however, in which the demonstrator was asked to call, the need of instruction was so obvious that it was deemed advisable not to wait for consumers to ask for a demonstrator to be sent, but to notify every consumer for whom a cooker was fixed that a demonstrator would call on a stated day, unless an intimation were received that some other day would be more convenient. The result is that now in 70 cases out of every 100 full instruction is given, to the great satisfaction of the consumer, and the undoubted benefit of the Company. In the remaining 30 per cent. of cases, the consumers are quite certain they understand the use of the stove and do not wish for instruction; and this is probably the highest percentage among any body of users of gas cookers who really do know just how to use them – if, indeed, all the 30 per cent. know as much as they think they do, which is doubtful. The consumers who are willing to listen to what the demonstrator has to say either "never can bake cakes successfully by gas," or they "don't know what the solid shelf is intended for, and it is hanging up in the scullery," or they "never can make decent toast," or "haven't realized that you can cook more than one thing at a time in the oven," or never turn the gas down after the oven is hot, and so think cooking by gas rather expensive, or don't know one or more of a dozen other things that it is essential they should know in order to get the best results out of their cookers.

In many cases in which a demonstrator has called by request, the cooker has been used for many years previously, and it has been the husband who – judging possibly by sad experience that there was a possibility of improvement – has (contrary to his wife's wishes) asked that a demonstrator should be sent. Such cases afford the demonstrator an excellent opportunity for the display of the tact which is one of the essential qualifications of those employed on this work, and rarely has one failed to convince the wife of the advantage of having expert advice on the use of the stove.

The Gas Light and Coke Company now have six expert ladies constantly employed on this work, and have already given instructions to well over 4,000 consumers, many of whom have called in their friends and neighbors to hear what there was to learn. This means that between 4,000 and 5,000 consumers know for certain that, while the Company desire them to use plenty of gas, they do not wish them to waste it, and that the Company are genuinely anxious that the consumers shall get the maximum amount of satisfaction out of the article sold to them. In other words, there are several thousand consumers certain to recommend cooking by gas to all their friends, and certain to speak well of the Company who have enabled them to realize fully its advantages. Such recommendations the author regards as an asset of which it is not easy to compute the value, and one which is now steadily increasing in value week by week.

Moreover, the lady demonstrators have opportunities for recommending to the consumers gas fires, hot water circulators, and other domestic gas appliances, without too obviously canvassing. They also hear sometimes of little grievances, cherished but not previously expressed, which they are able to explain away or report for attention; while a further, and a material, advantage of their visit following upon the fixing of the cookers is that it keeps the fitters right up to the standard all the time in regard to the fixing of the stoves and the leaving of all loose parts in their proper places ready for use. The writer can certainly speak of the system as one that has more than fulfilled expectations.

In regard to instruction respecting gas fires, in addition to the fitter showing the consumer or the servants how to light and use them, a post card containing direction on these points is sent out after the fixing of every fire. The following is the wording of the card:

On half the front of the post card:

In reference to the gas fire which the company have recently had the pleasure of supplying to you and which they hope is giving every satisfaction – your attention is invited to the information given on the other side respecting the lighting of gas fires.

If at any time your gas fires – or any other of your gas appliances – are not giving complete satisfaction, the company will be most happy to give you all possible assistance if you will kindly communicate with the Chief Office, as above.

On the back of the card:

How to Light a Gas Fire.—First light a taper. Then, *before* applying the taper to the fire, turn on the tap for an instant - to allow the gas to displace the air in the pipe between the tap and the fire—turn the tap off again, and then, after a second or two, apply the lighted taper to the center of the front of the fire, well above the burners and inside the fireclay fuel, and again turn on the tap.

The fire should then light with a blue flame and burn quietly. If the flame is yellow or white and burns with a "hollow" roaring noise, the gas should be turned off and relighted so as to obtain the proper flame. A fire lighted the wrong way gives little heat, while the burners and fireclay become choked with soot.

After a gas fire has been burning full-on for about 20 minutes or ½ an hour, and has become thoroughly hot, the tap should be partially turned off, so as to avoid any unnecessary consumption of gas.

No burnt matches, waste paper, cigarette ends, etc., should be thrown into a gas fire.

There is, however, a further service to be performed for the user of stoves, and that is –

(4) *The Periodical Examination and Adjustment of Gas Heating and Cooking Stoves.*

This service is one which has been tried for some months in a portion of the author's district, and so satisfactory is the result, and so apparent is its necessity, that it is now being extended to other areas. No one who moves about among the consumers on his district can have failed to observe what a large proportion of gas fires are allowed by their users (either through carelessness or ignorance – usually the latter) to get into a most unsatisfactory condition. The burners are choked with dust, broken fireclay, or soot; the fireclay lumps broken, disarranged, sooted up through the fire having been incorrectly lighted, or choked with cigarette ends, matches, or rubbish; and possibly the flue detached from the elbow through the stove having been shifted by servants when cleaning the hearth. When things get quite unbearable, some consumers send for a local gasfitter, others communicate with the gas company, while others throw out the fires and denounce the use of gas fuel thenceforth, simply because they do not realize that things could have been very different and no one has made it his business to enlighten them.

Similarly, though probably not to such a serious extent, are gas cookers neglected and allowed to become unsatisfactory, if not unusable, with the result of dissatisfaction to the consumer and very likely a reduced consumption of gas. To meet this undoubted drawback to the increased popularity and the extended use of gas for heating and cooking, a system of periodical stove inspection and adjustment is undoubtedly called for, and the writer's company are not the first to adopt such a system. It may be remembered that Mr. Andrew Dougall, in his Presidential Address before the Institution in 1903, mentioned the introduction of a stove inspection scheme by his company at Tunbridge Wells.

If, then, an undertaking has organized the services of supplying on favorable terms and fixing at a reasonable charge all kinds of apparatus for the use of gas; of mantle maintenance; of instruction in the use of stoves; and of stove maintenance - it has really done much towards insuring the satisfaction of its customers, present and to come; but it has by no means done all necessary to achieve that end.

II.—Instruction of Staff and Workmen.

It must next take every precaution to insure that those services are rendered in a thoroughly skilful manner, and with this end in view must take steps to instruct the workmen who have to carry out the practical work of fixing and maintaining gas appliances in all the details of their construction and the principles governing their use, and also to enable the staff who have to supervise the men, and who have to discuss practical and commercial questions with the consumers, to acquire all the knowledge that will be helpful to them in the performance of their duties. With a view to achieving these ends, the Gas Light and Coke Company are carrying through a series of practical demonstrations to all their fitters and their assistants of the correct and the incorrect way of fixing and adjusting gas apparatus. The men themselves take part in the demonstration work, which is accompanied and followed by clear and simple explanations of the causes which produce the desired and the undesired effects - entailing, necessarily, descriptions and explanations of the construction of each appliance. It is found that the men greatly appreciate these courses of instruction, which help them to take a greater interest in their work and are of no little assistance to those who are anxious to qualify themselves for advancement in the service.

These latter men have also open to them—as they are open to all the staff of the Department—courses of lectures (followed by examinations) dealing in much greater detail and on more scientific lines with all the matters with which it is essential that the district representatives of a gas undertaking should be familiar. These include, not merely full information respecting the varied uses of gas, but also

accurate knowledge concerning all its competitors—electricity for lighting and for power, producer gas, steam, oil, and acetylene—and therefore constitute a wide field of study and instruction. As a supplement to these lectures, the staff meet from time to time to hear and discuss papers on subjects connected with their work, contributed generally by one of their number. The officers in charge of the ten local offices from which groups of districts are worked also periodically meet for the discussion of matters of common interest; so do the head show room men; and so do the foremen.

Moreover, representatives of the inspectors and of the collectors meet from time to time to talk over questions arising out of their experiences on the district, and to consider any suggestions that may be made for furthering the Company's interests—and it may be added that such suggestions are asked for and welcomed from every servant of the Company. Everything possible, in fact, is done in order to secure the interchange of ideas and experience throughout the staff, and to increase the knowledge and the efficiency of every member of it. This is more than ever necessary in these days, when the public expect to receive from gas representatives—and it is desirable that gas undertakings should be willing and anxious to give—reliable information and unimpeachable advice on all matters connected with the use of gas; and when at any time those representatives may be called upon to discuss with shrewd business men the relative merits of gas and its competitors.

Given the organization of the services necessary to insure the satisfaction of the consumer, and a well-trained staff to carry out those services, there remains to be developed one other line of action necessary to secure the fullest results from the personal efforts of district representatives to increase the use of gas by existing consumers and to secure additional customers. And that is, a carefully organized and properly directed system of—

III.—Advertising (Including Circularizing and Canvassing).

The author is a firm believer in the advantages of advertising. A business that keeps itself constantly in the minds of the public by attractive, interesting and persuasive, but not vulgar or flamboyant, advertising—advertising which is a truthful, if forcible, statement of the advantages that can actually be realized, not the untruthful puffing of something that has no real value—will always be regarded with more favor by the public than a somnolent, silent concern that hides it light beneath a bushel. The public undoubtedly have a leaning towards dealing with a firm having a reputation for being businesslike and up to date. Moreover, the entry of a gas company into the arena as an advertiser does much to remove from the minds of the public the idea that it is a business relying upon a monopoly for its success. It takes up its stand as a trading concern seeking the patronage of the public on the merits of what it can do for, and supply to them, and is consequently viewed in a very different light by its customers from that in which they would regard a statutory company which contented itself with leaning upon statutory rights.

In regard to this question of advertising, the gas managers of this country have much to learn from their American brethren, who have (with much benefit to their undertakings) developed that line of action on a scale and with a thoroughness that have been far in advance of what has been attempted In this country. The writer has several kind friends on the other side who have furnished him, and continue to furnish him, with full particulars of what is being done over there on the publicity side of the gas business; and the enterprise of American Companies in the way of pushing the sale of gas would be quite startling to some gas administrators in this country if they could know as much of it as the writer has had the privilege of learning.

Press advertisements should go straight to the point in as brief but effective a manner as possible. One strong line embodying a point strictly relative to the substance of the advertisement, yet calculated to arrest the attention of anyone glancing at it, is very helpful to the effectiveness of the matter, which should be worded tersely and convincingly, with a view to leaving some definite thought in the mind of the reader. Suitable pictorial matter is also very effective, but it must be really well done. Every statement made in an advertisement should be absolutely true and free from exaggeration, which would only bring discredit eventually upon the undertaking which issued it. As one of the journals devoted to the subject recently said: "Truth in advertising—apart altogether from the ethics of the question—is vital to its success, and the most successful advertisers are those whose announcements stick more closely to true and accurate description." The matter of press advertisements should be varied frequently, and the subject be changed according to the season of the year—cookers and hot water circulators in the spring and summer, lighting and gas fires in the autumn and winter.

Where, however, should a gas undertaking advertise? First, in the daily and weekly papers whose circulation coincides, as nearly as may be, with the area of supply. This does good in more ways than one; it not only keeps the company's name to the fore and leads to an increased use of gas, but it also insures a friendly attitude on the part of the Press. By this it is not meant that the Press is to be bought by advertisements, or that it shows undue favor to advertisers, but that amicable relations with the Press help to prevent uninformed and misleading statements being made in the papers, as in the event of reports affecting an advertiser reaching the Press, inquiry would be made of him, and his side of the question would be considered before the publication of what, but for correction, might be altogether misleading.

Moreover, the supply and the multitudinous usages of gas involve domestic, industrial, and public questions that are of interest to practically every reader of the newspapers. There is therefore often information that can be given by a gas manager which would constitute interesting copy for the Press. But it is only human nature to expect that an editor will take a more liberal view of the space that can be devoted to such information, however interesting and useful it may be, if the person who supplies it is a purchaser of space in the advertisement columns than if he is not. The business world is a business world, and newspaper proprietors, faithful public servants as the vast majority of them are, after all, business men.

In the case of the author's company, it is not possible to confine their advertising to papers the circulation of which is limited to the area of supply, as the many valuable periodicals which appeal specially to the housewife and which are published and have a considerable circulation in the metropolis, also have a large circulation up and down the country. The company's advertising in these publications, therefore, as is proved by correspondence received from consumers outside the district, benefits the industry generally to some extent. Of course, such advertising would not be done if it could be avoided, because it is not any company's business to advertise for the benefit of others; but if those others felt inclined to bear a share of the expense, the volume of advertising could be increased, to the advantage of the industry as a whole. The writer will only add that he is not authorized to give receipts on behalf of the Gas Light and Coke Company; but remittances addressed to their Cashier will receive prompt attention. Seriously, the question of a joint fund for advertising in publications of general circulation is one to which he thinks consideration might well be devoted by the Institution.

In the second place, poster advestising may be resorted to for special occasions or at special seasons. The principal point to be observed here is that a poster to be any good at all must be a large one; and then it must be attractive and very pointed. One ought never to have to stop to read a poster—it must be a case of "he who runs may read."

Another field altogether for advertising is that of the direct appeal to the customer. Very few consumers use as much gas as they would if they realized all the many ways in which it can be consumed to advantage in the home and in the place of business. The "Sale of Gas" department should therefore be frequently talking to their customers by circular, catalogue, pamphlet, or booklet. Consider indeed, how much more easy and less expensive this is for a gas undertaking than for a firm which is never quite sure who are or who might be its customers. A draper may send out ten circulars to people he hopes are, or will be his customers, yet only one of the ten people may ever come to him for drapery. But every single person within a gas company's district must come to it for gas, if he goes to anyone; so that circularizing is necessarily more fruitful of result per pound expended when addressed to the customers of a gas company than when addressed to those of almost any other concern.

The remarks as to truthfulness, aptness, and convincing wording, which have been made in regard to Press advertisments, apply, of course, to circulars and pamphlets; the latter, however, lending themselves better than any single advertisement to a complete and well-argued statement of a case. The one therefore serves as a complement to the other; and it is often well to ask the reader of an advertisement to write for a pamphlet dealing more fully with the subject advertised. Appropriate illustrations, if well done, add materially to the value of a pamphlet. Then it should be pointed out that a gas company has many natural oportunities for sending circulars, etc., to its customers at very small cost. An advertisement can be issued with, as well as on, every account, with every receipt, with

every acknowledgment of a communication, and in every letter. Then every quarter, if necessary, circulars, etc., can be delivered by the meter readers. Circulars are most effective when they take the form of letters printed in imitation type-writing and addressed personally to each consummer by the type-writers. No circular letter designed to bring in orders should ever begin "Dear Sir or Madam," as so many do. Such an opening inevitably consigns the letter to the waste-paper basket.

It has been found advantageous to sort out, specially circularize, and canvass all consumers who use considerably less gas than their neighbors, as well as those residents in the district who use no gas and are desirable as consumers. It is also necessary to watch very carefully all capped services, and capped stove supplies. To the latter may be attached post card forms ready for the consumer to send to the district office if a stove is wanted. New and empty premises also require to be watched closely. In regard to the former, every effort should be made to secure the adequate canvassing of all premises during erection. In regard to the latter, the district representatives should always keep an eye on furniture removing vans, as they thereby can often get into touch with incoming tenants at the earliest possible date, and secure their orders in good time. It need perhaps hardly be added that the asking for deposits should be avoided, except in the case of really "doubtful" customers. A very low bad debt percentage can be very dearly bought, and this endeavor to avoid altogether the risks that necessarily attend a commercial enterprise has done much harm to many a gas undertaking in the past. Reasonable care should be taken to avoid being defrauded by unscrupulous and dishonest persons; but to take no risk at all in business is to make poor profits, and to achieve an unenviable reputation in the commercial world.

The author has he thinks now dealt, more or less completely, with the main points to which attention has to be given if the sale of gas is to be forwarded effectively by a staff organized on the lines he has suggested. Much more might be said on many of these points; but he feels that his paper has already far exceeded reasonable limits, and can only plead the importance of the subject, and his belief in the great possibilities it holds for the gas industry as a whole, as his excuse for having presumed to levy such a heavy tax upon the attention of his hearers.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, July 10th, 1907.

Technical Meetings.—Some Questions of the Day.

The publishers of our technical magazines must have had a lively time during the last month, judging from the thickness of the numbers that have been issued from their offices. Thanks to their efforts, those who from one cause or another are unable to leave their own particular potato patch, are able to learn all about the proceedings at Dublin and elsewhere. The only thing is to find time to read them. I question whether there exists any gas manager in active harness, who is able to read his gas papers through from beginning to end. The majority have to satisfy themselves with a cursory perusal, at odd moments, of the subjects in which they are for the moment particularly interested. The chief claimant for space was, of course, the Dublin meeting. This was a most successful function in every respect. The business part of the proceedings had been carefully worked up at the offices of the Institution of Gas Engineers in London, under the skilled and experienced guidance of the President, Mr. Chas. Hunt, and meanwhile the Irish Executive Committee, headed by Mr. F.T. Cotton, of the Dublin Gas Company, had not been idle. A successful meeting is never a matter of chance or of spontaneous growth, but turns greatly upon taking time by the forelock and leaving nothing till the last minute, and as the result of combined labor the visitors to Dublin enjoyed both a profitable and a pleasant week, the only drawback being the weather, which was not all that could be desired. With an excellent business programme, an international exhibition, the special natural charm of the neighborhood, and the characteristic Irish hospitality which bulked largely in evidence throughout, the visitor was occasionally in the position that he could have been happy with either. In addition to the Gas Institute meeting, there have been the corresponding annual gatherings of the French and of the German Gas Managers, the conference of Civil Engineers in London, and a few other functions that come under the nature of side shows, from our point of view.

The cosmopolitan character of our industry was illustrated by the fact that all these gatherings the foreign element was represented. For instance, the attendance at Dublin included representative engineers from Denmark, France and Germany, Japan and the United States. Two of the papers were written and read by gentlemen from the other side of the Atlantic. And the London Gold Medal awarded in connection with last year's papers, was carried off by Herr E. Körting, of Berlin. It is also evident, from a comparison of the different programmes, that the interest in certain leading lines, such as vertical retorts, systems of carbonization, high pressure distribution, and the commercial department, is not confined to any one country or indeed to any one continent.

There was a time—and that not so very many years ago—when papers and discussion on gas engineering subjects were regarded as approaching the superfluous. The attendance at association meetings dwindled for want of sufficiently exciting or interesting subjects. Secretaries and committees were at their wits end to get papers that would prove generally attractive, and an impression appeared to be gaining ground that the last word of any value had been written or said. Visits or excursions had to be resorted to as a means of making up a programme, or the assistance of outsiders had to be sought. But this condition of things appears to have passed away and the pendulum is now swinging the other way. There is quite a plethora of real live subjects to discuss, and the difficulty is now towards getting the programme into the allotted time without omission or undue hurry. The question of working up some subject or other has given place to the more satisfactory but if anything more onerous duty of making a wise selection. The difficulty applies in a limited sense to the work of writing a brief review that shall clearly indicate the nature of the proceedings, and perhaps the better way will be to rest satisfied with a passing reference to a few points, not necessarily the most important, but simply the first that come to mind.

Prof. Vivian B. Lewes delivered a lecture on the use of gas from a hygienic point of view, in which he dealt plainly with the facts relating to the combustion of gas in ordinary living rooms—a question which it is needless to say has been grossly misrepresented by interested parties. To some extent this disingenuous policy has proved its own undoing, as is usually the case. When people have been accustomed to use gas for half a century or more, and never experienced any ill effects, they are apt to attract little importance to hysterical twaddle about the pernicious influence of the products of combustion from gas. But unless the actual truth is plainly put before them, they are apt to conclude that there must be something unwholesome or objectionable about it. Any gas engineer who has listened to or read the account of the lecture is provided with facts that prove that the atmosphere in a room lighted by gas is if anything purer than one not so lighted, for the simple reason that the heated air and products of combustion rise to the ceiling, and are diffused through the porous plaster, their place being supplied by fresh air from outside. In an ordinary sitting or living room, say 15 feet square and 11 feet in height from floor to ceiling, lighted by 3 or 4 incandescent burners, either depending from a central hanger, or carried on wall brackets, at a height of about 7 feet from the ground, the air breathed by the occupants is actually pure when the gas burners are in use. It is important to notice that in order to secure this satisfactory result the lights should be situated well above the heads of the occupants. This point, however, is likely to receive attention for other reasons, as it is most objectionable to have a brilliant light on a level with or below the line of sight, and the inverted form of burner, which continues to grow in favor, notwithstanding its sensibility to slight differences of pressure or variations of quality, requires a height of at least 7 feet for proper diffusion.

The inverted form of burner was especially considered in a paper read by Mr. Harold F. Copp, who gave the results of a large number of tests. A careful perusal of the paper serves at once to explain the popularity of this form of burner, and also the difficulties that have been experienced. It shows that the troubles are not insurmountable, but are likely to give way and disappear with extended experience. The inverted burner appears to be a fascinating subject for inventors, judging from the number of patent specifications that are filed. Many of them show evidence that the inventor has not thoroughly mastered the principles concerned. High pressure lighting does not appear to make much progress. The only use for it is the few instances where a powerful light center is required. Centers of 60 to 100-candle power, such as can be readily obtained with plain incandescent burners, furnishing a duty of over 20 candles per cubic feet of gas used per hour, answer all ordinary purposes, and are so cheap in respect to consumption that there is no inducement to go in for still further economy.

It has been shown over and over again that the great advantage possessed by gas is simplicity, and a high pressure air supply or other mechanical accessories tend to take this away. Instead of having an arrangement that can scarcely by any ordinary possibility get out of order, we have simply an ordinary piece of machinery with the usual troubles and risks. Its efficient working is dependent upon constant skilled attention, and periodical overhauling and repairs.

A great deal of attention has been given to the gas fire, and the use of gas as a heating agent, but nobody appears to have considered seriously whether a company supplying heating gas only could afford to sell at a price that would earn a dividend. It is all very well as a subsidiary line, taken through pipe systems that are chiefly required for cooking or lighting supplies, but if moved from the back seat to the front, the unfortunate manager would have a lively time of it. The fluctuations in demand according to variations in the weather would not only be very large, but very uncertain, and to run the thing with any practical possibility of success it would require a new process of manufacture that would admit of momentary variation in the rate of production. The distributing pipes would have to be large even with the assistance of much higher supply pressures than are at present usual. And with every possible advantage it would be necessary to have a climate made to order free from the sudden and unexpected changes that are the usual experience in the British Isles and also in many other parts of the world. These remarks, of course, refer to ordinary household heating. In manufacturing districts it might be possible to work up a steady trade for technical purposes that would mean a fairly constant demand independent of weather, and affected only by the exigencies of trade. At present the most promising lookout for heating business lays in the direction of coke, using the word in a wider sense than is customary. A solid fuel possesses the advantage that its specific gravity is much greater than a gas, and that it offers greater facilities for storing. No one would care to store very much more than 24 hours' make of gas, but there is no particular difficulty about storing several weeks supply of coke. The question of conducting carbonization with a view to the quality of the coke produced, although new, is attracting a great deal of attention. The two papers submitted at the Institution meeting were followed with close attention. It has been held that the fuel of the future must necessarily be a gas, and that the advantages offered by that form of matter were conclusive in its favor. But it is evident that an opinion is steadily growing in favor of the solid fuel.

High pressure distribution is slowly but steadily gaining ground. With the disappearance of the open flat flame burner, the consumer loses his objection to it. We may now say that most of the appliances by which gas is used are favorable to high pressure rather than otherwise. The advantage secured by increasing the pressure to an incandescent burner applies equally to almost any form of atmospheric burner whatever its purpose. The question in some districts is whether the demand for gas will not overstep the practicable sizes of main pipes. It is obvious there must be a limit to the diameter of a pipe, and as that limit is approached the expense of laying and of maintenance is largely increased, to say nothing of the increased risk. A broken 12-inch pipe is a more manageable article than a damaged 40 or 50-inch. Yet year by year the output from the gas works continues to advance, while the increased use of the subsoil for all sorts of public services, accentuates the difficulty of laying larger conduits. Another consideration is the distance to which gas is now carried. The day of the 1-mile limit is gone. Townships expand and increase, and it is an insignificant undertaking that does not cover 4 or 5 miles, while 10, 15, or even 20 is not uncommon. Undertakings could be quoted by the dozen, that to-day are dependent upon accelerated pressure in some form or another for the maintenance of a sufficient supply. High pressure may or may not be desirable, but it seems likely to become a necessity. As much being admitted, it is for practical men to direct their attention to making the best of it. Any dangers or disadvantages incidental thereto must be overcome or at least minimized.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

An "International affair" has been happily averted through the tact of Mr. Courtland Bishop, President of the Aero Club of America, who was in Paris when the Aero Club, of France, received a cable from St. Louis, Mo., declaring there could be no balloon ascension from St. Louis on the date (Oct. 19) previously set for it. The French are, as is generally known, a people prone to act impulsively, and the Aero Club Francais, through its officers *rose choleric*. "No race; *pourquoi?*" exclaimed the French President! Luckily President Bishop was on the job—he had, too, received fuller information respecting the reason for the message. Hurrying to French balloonistic headquarters, he restored *l'entente cordiale* by explaining that the race would have to be put over from the 19th Octubre to the 21st Octubre because: The Laclede Gas Light Company, of St. Louis, does not manufacture gas during Sunday, so the tanks at Choteau and Newstead avenues would have to be filled over Saturday (Oct. 19) to carry the supply for Sunday, the 20th. At the beginning of Monday the manufacturing would begin and the holder would be all up with gas sufficient for the balloonistic needs at noon of the 21st! *Bon jour; bonne encore!*

Dear Journal: "On July 13th, in busy Battle Creek, Mich., Mrs. Chas. R. Riley asked her husband not to forget to pay the gas bill that day, since it marked the last discount 24 hours at the Company's office. Riley, in an imperious manner, and loud of tone, ejaculated 'Down with the gas trust,' and with that slapped his spouse. She had him arrested. The end is not yet, nor soon, for thus doth the gas men cause dissension amongst men—and women!—R. V. M."

"B.," writing from Fredericksburg, Va., under date of the 20th inst., says: "Superintendent B. F. Bullock, of the City Gas Works, of this place, is to be congratulated over the success that has so far attended his works' management of the gas plant in this city. The last fiscal year ended June 30th, and the reports show that the send-out for the twelvemonth exceeded that for 1906-07 by 25.77 per cent., and the increase is all the more remarkable from the fact that not a foot of main extension was performed, and which latter is a'l the more regrettable from the fact that in about every point of the compass people are clamoring for a gas supply. The leakage, too, was cut from 16.4 per cent. to 10 per cent. Late in the spring Miss Anna V. Miller was employed to give a series of public demonstration lectures on the use of gas for cooking—the first given in this city—and the result is that on July 10th there were just twice as many gas ranges in use in Fredericksburg than was the case the year previous. The further result is that a year ago the night sendout was two-thirds of the total made; now the day output is in excess of the night output. Finally, the increase in meters set is something over 10 per cent.; so it would look that, given a suitable main extension provision, Mr. Bullock is bound to make doubly good."

During the first 6 months of this year the output of the Detroit City Gas Company amounted to 1,204,074,300 cubic feet.

"T. V. L.," writing from Springfield, Mass., under date of the 22d inst., says: "The annual meeting of the Easthampton (Mass.) Gas Company this year (it was held the 17th inst.) was unusually important, in that questions of expenditure were to be decided. The first of these was a proposition to increase the capital stock of the Company from $30,000 to $50,000, the second was to increase the membership of the Board of Directors from 3 to 5. Both changes were ratified. The capital increase was needed for main extensions and for the development of the electric lighting division of the trading. The annual reports showed that the Company had enjoyed a very prosperous year. The usual semi-annual dividend of 3 per cent. was declared and the officers chosen were: Mrs. V. J. Kingsland, Messrs. H. L. Clark, G. L. Manchester, C. J. Johnson and E. H. Banister. President, H. L. Clark; Treasurer, G. L. Manchester; Secretary, John N. Lyman."

At the annual meeting of the Taunton (Mass.) Gas Company these officers were elected: Directors, John E. Sanford, Wm. C. Davenport, E. Davol, John E. Browne and Frank L. Tinkham; President, J. E. Sanford; Treasurer and Secretary, Walter T. Soper.

Mr. William O. White has been elected gas inspector for Memphis, Tenn.

Councilman Lewis, of Cleveland, O., is responsible for a city ordinance which directs that the Cleveland gas companies shall have men always in readiness to respond to fire calls, said men to be furnished with the necessary wrenches and keys to shut off the gas supply to burning buildings. It is also directed that the firemen be obliged to carry shut-off keys.

There will be more gas used hereafter in the home of Mr. Perry B. Schofield, Inspector for the Hartford City (Conn.) Gas Light Company, than heretofore. That is, when he returns from his outing in Nova Scotia, where he is on his wedding tour. It is likely that the same thing will happen in the home of Mr. Bingham, father of the bride.

THE owners of the Milwaukee (Wis.) Gas Light Company have arranged for increasing the capital stock to $5,000,000, an addition of $4,000,000.

AT the annual meeting of the Municipal Gas Company, of Albany, N. Y., the following officers were elected: Directors, A. N. Brady, Robert O. Pruyn, William McEwan, Horace G. Young, John Bowe, Jno. A. Delehanty and E. B. Cantine; President, A. N. Brady; Vice-President, Robt. C. Pruyn; Treasurer and Secretary, E. P. Gavit. A regular quarterly dividend of 2½ per cent. was declared, made payable to-day.

THE Directors of the Pacific Gas and Electric Company, of San Francisco, Cal., have voted to levy an assessment of $10 per share on the capital stock, the proceeds to be devoted to "rehabilitation and improvement purposes."

THIS explains itself—it was mailed from New Haven some days ago: "Dear JOURNAL: I notice you have reported several outings recently enjoyed by the rank-and-file of many gas works. Well, here is a little account of the New Haven (Conn.) Company's latest in the direction indicated. The outing was held about a fortnight ago, the scene of the affair being the South End, which certainly was fixed up to the merry. About 150 were in the party and not one missed a minute of the good time. Various pastimes were engaged in, and the hero of the fray was 'Barnesy,' who won 3 out of the 7 events. The real thing, though, was the base ball game between the office department and the fitting department. It was a pity that the former did not know more about the game. However, they were not Chicagoed; the score was: office 9; fitters, 17. It is hardly even possible that the office could beat the fitters taking in high balls. The shore dinner served up by Landlord Smith, of the South End Hotel, was all that it should be, and Toastmaster Guer was likewise. In fact the stove man makes good, wherever he goes. The committee in charge had everything in peachy order. They were Messrs. C. O. Williams, F. G. O. Barnes, W. M. Bates, A. Gardner, C. Hine, J. Beanton and A. Clark."

PROF. CHARLES F. CROWLEY, the official gas inspector for Omaha, Neb., seems to be finding out that the gas supplied by the Omaha Company is well above every legal requirement.

PROF. GEORGE F. SEVER, of Columbia University, has been engaged by Commissioner O'Brien, of the Department of Gas, Water and Electricity, to reconstruct the electrical service of the Police Department of New York.

MR. FRANK G. DRUMM has been elected President of the Pacific Gas and Electric Company, of San Francisco, Cal., vice Mr. John A. Britton. The latter, however, is to act as President of the operating Companies that go to make up the first named incorporation.

A QUEER accident recently cut out the gas service from Hancock, Mich. The named district is supplied with gas from the Houghton County Gas and Coke Company's main under Portage Lake, and the U. S. Steamship Wolverine, while steaming up the Lake, with anchor swinging pretty close to bottom, preparing to come to for the night, fouled the main to the point of breaking it.

THE comfort of the residents of West Paterson, N. J., has been so much bettered by the gas supply recently laid on therein by the Public Service Corporation, that the residents of the adjoining borough of Totowa are anxious to have it "in their midst."

THE voters of Hedrick, Ia., in a ballot counting 102 in favor to 2 against, have assented to the proposition to sell the municipal gas plant to the promoters of the Carson-Foster Company. It is agreed that the rate shall not exceed $1.50 per 1,000 cubic feet, street lights are to be maintained at the charge of $2.30 per month per lamp, and a moonlight table is to be followed. The land and building are to remain the property of the town, the Company to have the use of same for a period of 5 years without rental payment. The new owners assume charge the 1st prox.

THE betterments on the plant of the Sedalia (Mo.) Light and Traction Company have been completed, and the apparatus is working satisfactorily. About $18,000 covers the expenditure.

A CORRESPONDENT inclosed the following, under date of the 20th inst., from Peoria, Ills.: "'Cook with gas' stares the local bridge tenders every time they look out along the bridge, and because it obstructed their view of inspecting the lights, the matter was brought up at a meeting of the City Council last week. It was decided that inasmuch as no permit had been given for the placing of this sign on the bridge, that it should be removed. Alderman Fogelmark thought that the Council should consider that the Company had gone to considerable expense in having the sign made and placed and that if the sign could be so arranged as not to obstruct the view of the tenders that it should be permitted to remain, which idea was acquiesced in by other members of the Council."

THE Trenton (N. J.) *Times*, of the 19th inst., had this to say: "Damage to the extent of several hundred dollars was caused by a lightning flash which struck the unused gas plant of the Public Service Corporation in the rear of Brunswick avenue near Paul avenue, yesterday afternoon. Two large holes, about 30 feet square, were torn in the roofs of the retort and engine house and practically every pane of glass in the structure was shattered. James Ward, the watchman, was in the place at the time, but escaped injury."

THE Yuma (Ariz.) Gas Company has been incorporated with a capital of $50,000, by Messrs. Seth Hartley, A. L. Drew, F. W. Greff, Howard Sur and Z. T. Bell. Mr. Seth Hartley is the main one in interest. His home is in Colton, Cal.

THE last payment to the city treasury by the Wyandotte Gas Company, which supplies gas to the West Side district of Kansas City, Mo., was $4,948.46, which sum represents 2 per cent. of the Company's gross earnings for the first half of 1907.

THE following sensible and judicial editorial article appeared in a recent issue of the New York *Commercial:* "There appears to be a large measure of common sense and of logic in the contention of the Counsel for the Consolidated Gas Company in the matter of compensation for a portion of a lot of land near the foot of West Eleventh street, taken through condemnation proceedings by the city of New York for dock improvements. The Commissioners of Estimate and Assessment, after reaching a conclusion as to what would be a fair award for this parcel—namely, $181,685, because in their judgment the portion of the lot that was left would be increased in value to that extent by the dock and river front improvements; the Company appealed and took its case into the courts. Its attorney argued that the award was unjust and unequal, because the owner of a parcel that was entirely taken would receive full payment, while an owner whose property was not taken at all would receive the full benefit of the improvement without any deduction. The Appellate Division of the Supreme Court has just decided against the Company, however, its opinion holding that the points raised are immaterial, as the question involved is not one of taxation or assessment, and that the general rule of law supports the action of the Commissioners in making the deduction for increase of value. That may be good law—presumably is, or the Appellate Division would not have so held—but the principle has in it vast possibilities of injustice. The city might condemn at $100,000 each 9 lots all held by different owners, and at $50,000 half a lot held by another owner; but, applying this principle and deducting $15,000 from the latter award for estimated benefits to the remaining half-lot, the municipality would certainly mulct the owner for his misfortune in having only half of his lot needed. Exact justice would seem to require an equitable distribution of the betterment deductions, in such cases, among all the property owners affected."

MAIN extensions have been planned for the St. Joseph (Mo.) Gas Company's distribution system that will involve an expenditure of $15,000.

THE Mishawaka and South Bend (Ind.) Gas Company will also add largely to its main system.

THE franchise for the governing of the Woodstock (Ills.) Gas Company, the main one in interest being Mr. D. R. Joslyn, has been granted. It is proposed to begin construction work there at once.

THE new gas plant at Greeley, Col., is about completed. It is proposed to extend the mains therefrom to and through the outlying districts of Evans and Eaton.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance.
Single copies, 10 cents.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JULY 29, 1907.

The Market for Gas Securities.

In so far as quotations for Consolidated gas go, the figures for this week are those of a week ago. No stock is offered. Since the first inst. some inquiry for gas bonds has been in evidence, and the market in respect of accredited bond issues is firm to strong. Brooklyn Union remains lifeless. When the full effects of the Pritchard decision, and the findings of Referee Masten are felt, investors will wonder at their obtuseness over the failure to purchase of New York gas shares.

Massachusetts Gas Companies is again at the 60 mark, the preferred being quoted at 84. Both are cheap. Washington (D. C.), chiefly on realizing sales, dropped to 380. These shares should be worth intrinsically 500. The general market for gas bonds is in favor of holders.

Gas Stocks.

Quotations by George W. Cloke, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JULY 29.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	117	120
Central Union Gas Co.—				
1st 5's, due 1872, J. & J.	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	235
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	98	100
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	106	112
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	999,650	500	110	..
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅝
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Tr 1st	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	.
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnat Gas and Electric Co.	29,500,000	100	98	98½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	.
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	87	88
Preferred	3,026,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	90
Mortgage, 6's	3,000,000	..	..	115
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
Bonds, 5's	10,500,000	..	107½	108¼
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	05
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104½
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	46	53
Massachusetts Gas Companies of Boston	25,000,000	100	59	59¼
Preferred	25,000,000	100	83¼	83¾
Montreal, Canada	2,000,000	100	215	215¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	91¼	91½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
" 2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	375	380
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600,000	50	220	..

Advertisers' Index.

GAS ENGINEERS. Page

A. E. Boardman, New York City ... 203
Baxter & Young, Detroit, Mich. ... 211
B. E. Chollar, St. Louis, Mo. ... 204
Cruse-Kemper Co. Philadelphia, Pa. ... 200
Davis & Farnum Mfg. Co., Waltham, Mass. ... 212
Economical Gas Apparatus Construc'n Co., Toronto, Ont 211
Frank D. Moses, Trenton, N. J. ... 214
Frederic Egner, Norfolk, Va. ... 216
H. M. Byllesby & Co., Chicago, Ills. ... 212
Humphreys & Glasgow, New York City ... 212
Isbell-Porter Co., Newark, N. J. ... 200
Kerr Murray Mfg. Co., Fort Wayne, Ind. ... 213
Practical Gas Construction Co., North Chicago, Ills. ... 212
The Gas Machinery Co., Cleveland, O. ... 196
The Jeffrey Manufacturing Co., Columbus, O. ... 210
United Gas Improvement Co., Philadelphia, Pa ... 207
Western Gas Construction Co., Fort Wayne, Ind. ... 176

GAS WORKS APPARATUS AND CONSTRUCTION.

A. E. Boardman, New York City ... 203
Bartlett, Hayward & Co., Baltimore, Md. ... 213
Baxter & Young, Detroit, Mich. ... 211
Connelly Iron Sponge & Governor Co., New York City ... 209
Continental Iron Works, Brooklyn, N. Y. ... 214
Cruse-Kemper Co., Philadelphia, Pa. ... 200
Davis & Farnum Mfg. Co., Waltham, Mass. ... 212
Deily & Fowler, Philadelphia, Pa. ... 216
Economical Gas Apparatus Construc'n Co., Toronto, Ont. 211
Frank D. Moses, Trenton, N. J. ... 214
Humphreys & Glasgow, New York City ... 212
Isbell-Porter Company, New York City ... 200
Kerr Murray Mfg. Co., Fort Wayne, Ind. ... 213
Lloyd Construction Co., Detroit, Mich. ... 202
Logan Iron Works, Brooklyn, N. Y. ... 216
Quintard Iron Works, New York City ... 212
R. D. Wood & Co., Philadelphia, Pa. ... 214
Riter-Conley Mfg. Co., Pittsburgh, Pa. ... 215
Stacey Mfg. Co., Cincinnati, O. ... 215
The Gas Machinery Co., Cleveland, O. ... 196
The Jeffrey Manufacturing Co., Columbus, O. ... 210
United Gas Improvement Co., Philadelphia, Pa. ... 207
Western Gas Construction Co., Fort Wayne, Ind. ... 176

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md. ... 213
B. E. Chollar, St. Louis, Mo. ... 204
Economical Gas Apparatus Construc'n Co, Toronto Ont 211
Humphreys & Glasgow, New York City ... 212
Semet-Solvay Co., Syracuse, N. Y. ... 210
The Gas Machinery Co., Cleveland, O. ... 196
United Gas Improvement Co., Philadelphia, Pa. ... 207
Western Gas Construction Co., Fort Wayne, Ind. ... 176

SCRUBBERS AND CONDENSERS.

Continental Iron Works, Brooklyn, N. Y. ... 214
Cruse-Kemper Co., Philadelphia, Pa. ... 200
Davis & Farnum Mfg. Co., Waltham, Mass. ... 212
Economical Gas Apparatus Construc'n Co., Toronto, Ont 211
Isbell-Porter Co., Newark, N. J. ... 200
Kerr Murray Mfg. Co., Fort Wayne, Ind. ... 213
Logan Iron Works, Brooklyn, N. Y. ... 216
R. D. Wood & Co., Philadelphia, Pa. ... 214
Riter-Conley Mfg. Co., Pittsburgh, Pa. ... 215
Stacey Mfg. Co., Cincinnati, O. ... 215
The Gas Machinery Co., Cleveland, O. ... 196
Western Gas Construction Co., Fort Wayne, Ind. ... 176

PRODUCER POWER PLANTS.

Economical Gas Apparatus Construc'n Co., Toronto, Ont. 211
R. D. Wood & Co., Philadelphia, Pa. ... 214

TAR AND CARBONIC ACID EXTRACTOR.

Economical Gas Apparatus Construc'n Co., Toronto, Ont 211
Isbell-Porter Co., Newark, N. J. ... 200
Kerr Murray Mfg. Co., Fort Wayne, Ind. ... 213
Stacey Mfg. Co., Cincinnati, O. ... 215
The Gas Machinery Co., Cleveland, O. ... 196
Western Gas Construction Co., Fort Wayne, Ind. ... 176

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich. ... 194
The Gas Machinery Co., Cleveland, O. ... 196
Western Gas Construction Co., Fort Wayne, Ind. ... 176

GAS METERS.

American Meter Co., New York and Philadelphia ... 219
Detroit Meter Company, Detroit, Mich. ... 175
D. McDonald & Co., Albany, N. Y. ... 217
Helme & McIlhenny, Philadelphia, Pa. ... 219
John J. Griffin & Co., Philadelphia, Pa. ... 220
Keystone Meter Co., Royersford, Pa. ... 218
Maryland Meter and Mfg. Co., Baltimore, Md. ... 218
Metric Metal Co., Erie, Pa ... 209
Nathaniel Tufts Meter Co., Boston, Mass. ... 218
New York Improved Meter Co., New York City. ... 218
Pittsburg Meter Co., East Pittsburg, Pa. ... 217
Rotary Meter Co., New York City ... 195
United States Meter Co., Brooklyn, N. Y. ... 199

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia..... 219
D. McDonald & Co., Albany, N. Y..... 217
Helme & McIlhenny, Philadelphia, Pa..... 219
John J. Griffin & Co., Philadelphia, Pa..... 220
Keystone Meter Co., Royersford, Pa..... 218
Nathaniel Tufts Meter Co., Boston, Mass..... 218
New York Improved Meter Co., New York City..... 218
Pittsburg Meter Co., East Pittsburg, Pa..... 217

PREPAYMENT METER ATTACHMENTS.

New York Improved Meter Co., New York City..... 218

WATER METERS.

Pittsburg Meter Co., East Pittsburg, Pa..... 217

GAS AND WATER PIPES.

Davis & Farnum Mfg. Co., Waltham, Mass..... 212
Donaldson Iron Co., Emaus Pa..... 204
Economical Gas Apparatus Construc'n Co., Toronto, Ont. 211
R. D. Wood & Co., Philadelphia, Pa..... 214
Warren Foundry and Machine Co., New York City..... 204

GAS COALS.

Berwind-White Coal Mining Co., New York and Phila. 212
Perkins Co., New York City..... 212
Westmoreland Gas Coal Co., Philadelphia, Pa..... 211

SPECIALTIES FOR OIL AND PIPE LINES.

S. R. Dresser, Bradford, Pa..... 198

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., New York City..... 204

MAIN AND SERVICE LAYING.

Sullivan Bros., Flushing, N. Y..... 170

GAS TAPPING MACHINES.

George Light, Dayton, O..... 204
H. Mueller Manufacturing Co., Decatur, Ills..... 194

CANNEL COALS.

Perkins & Co., New York City..... 210

STOKING MACHINERY.

G. A. Bronder, New York City..... 209

CONVEYORS.

Cruse-Kemper Co., Philadelphia, Pa..... 200
C. W. Hunt Company, New York City..... 208
Economical Gas Apparatus Construc'n Co., Toronto, Ont 211
G. A. Bronder, New York City..... 209
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 215
The Gas Machinery Co., Cleveland, O..... 196
The Jeffrey Manufacturing Co., Columbus, O..... 210
Western Gas Construction Co., Fort Wayne, Ind..... 176

CHARGING BARROWS & COAL WAGONS.

Davis & Farnum Mfg. Co., Waltham, Mass..... 212
Kerr Murray Mfg Co., Fort Wayne, Ind..... 215
Stacey Mfg. Co., Cincinnati, O..... 215

GAS ENRICHERS.

Standard Oil Co., New York City..... 167

COKE CRUSHERS.

C. M. Keller, Columbus, Ind..... 211
The Jeffrey Manufacturing Co., Columbus, O..... 210

(Continued on page 194.)

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(Concluded from page 193.)

GAS METER CONNECTIONS.

H. Mueller Manufacturing Co., Decatur, Ills. 194

GAS COCKS.

H. Mueller Manufacturing Co., Decatur, Ills. 194

GAS GAUGES.

The Bristol Co., Waterbury, Conn. 231

GAS GOVERNORS.

Chaplin-Fulton Mfg. Co., Pittsburgh, Pa. 214
Connelly Iron Sponge & Governor Co., New York City. 199
Isbell-Porter Co., Newark, N. J. 200
Pittsburg Meter Co., East Pittsburg, Pa. 217
R. D. Wood & Co., Philadelphia, Pa. 214
Reynolds Gas Regulator Co., Anderson, Ind. 203

FUEL ECONOMIZERS.

Green Fuel Economizer Co., Matteawan, N. Y. 202

CEMENTS.

C. L. Gerould, Pittsburgh, Pa. 214

RETORTS AND FIREBRICKS.

Baltimore Retort and Firebrick Co., Baltimore, Md. .. 203
Gas Bench Construction Co., St. Louis, Mo. 208
Henry Maurer & Son, New York City. 203
James Gardner, Jr., Co., Pittsburgh, Pa. 210
J. H. Gautier & Co., Jersey City, N. J. 208
Laclede-Christy Clay Products Co., St. Louis Mo. .. 197
Missouri Firebrick Co., St. Louis, Mo 208
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. .. 199

INCLINED RETORTS.

Baltimore Retort and Firebrick Co., Baltimore, Md. 208
Gas Bench Construction Co., St. Louis, Mo. 208
Laclede-Christy Clay Products Co., St. Louis, Mo. 197
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 199

VERTICAL S'S.

Connelly Iron Sponge & Gov. Co. (Drake's Eng.] System) 209
Gas Bench Construction Co., St. Louis, Mo. 208
Laclede-Christy Clay Products Co., St. Louis, Mo. ... 197
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. .. 199

REGENERATIVE FURNACES.

Baltimore Retort and Firebrick Co., Baltimore, Md. 208
Bartlett, Hayward & Co., Baltimore, Md. 213
Gas Bench Construction Co., St. Louis, Mo. 208
J. H. Gautier & Co., Jersey City, N. J. 208
Laclede-Christy Clay Products Co., St. Louis, Mo 197
Missouri Firebrick Co., St. Louis, Mo. 208
Parker-Russell Mining and Mfg. Co., St. Louis Mo. 199

SELF-SEALING MOUTHPIECE DOORS.

Continental Iron Works, Brooklyn, N. Y. 214
Davis & Farnum Mfg Co., Waltham, Mass. 212
Isbell-Porter Co., Newark, N. J. 200
Kerr Murray Mfg. Co., Fort Wayne, Ind. 213
Logan Iron Works, Brooklyn, N. Y. 216
R. D. Wood & Co., Philadelphia, Pa. 214
Stacey Mfg. Co., Cincinnati, O. 215
The Gas Machinery Co., Cleveland, O. 196
Western Gas Construction Co., Fort Wayne, Ind. 176

INCANDESCENT GAS LAMPS.

General Gas Light Co., Kalamazoo, Mich. 2 1
Geo. G. Ramsdell, New York City 198
Welsbach Company, Gloucester, N. J. 206

BURNERS.

Wm. M. Crane Co., New York City. 198

STREET LAMPS.

Thos. T. W. Miner, New York City. 204
Welsbach Street Lighting Co., New York and Phila. .. 206

PURIFIERS.

Connelly Iron Sponge & Governor Co., New York City .. 209
Cruse-Kemper Co., Philadelphia, Pa. 200
Davis & Farnum Mfg. Co., Waltham, Mass. 212
Isbell-Porter Co., Newark, N. J. 200
Kerr Murray Mfg Co., Fort Wayne, Ind. 213
R. D. Wood & Co., Philadelphia, Pa. 214
Stacey Mfg. Co., Cincinnati, O. 215
Western Gas Construction Co., Fort Wayne, Ind. ... 176

PURIFYING MATERIALS.

Connelly Iron Sponge & Governor Co., New York City.. 209

VALVES.

Continental Iron Works, Brooklyn, N. Y. 214
Davis & Farnum Mfg. Co., Waltham, Mass. 212
Economical Gas Apparatus Construc'n Co, Toronto, Ont 211
Isbell-Porter Co., Newark, N. J. 200
Kerr Murray Mfg. Co., Fort Wayne, Ind. 213
Ludlow Valve Manufacturing Co., Troy, N. Y. 201
R. D. Wood & Co., Philadelphia, Pa. 214
Stacey Mfg. Co., Cincinnati, O. 215
The P. H. & F. M. Roots Co., Connersville, Ind 2 3
Western Gas Construction Co., Fort Wayne, Ind. ... 176

EXHAUSTERS.

Connelly Iron Sponge & Governor Co., New York City.. 209
Connersville Blower Co., Connersville, Ind. 196
Davis & Farnum Mfg. Co., Waltham, Mass. 212
Isbell-Porter Company, Newark, N. J. 200
Kerr Murray Mfg. Co., Fort Wayne, Ind 213
The P. H. & F. M Roots Co., Connersville, Ind. 203

PURIFIER AND SCRUBBER TRAYS.

Cabot Mfg. Co., Hoboken, N. J. 211
Western Gas Construction Co., Fort Wayne, Ind. 176

GAS STOVES.

American Meter Co., New York and Philadelphia. 219
Keystone Meter Co., Royersford, Pa. 218
Maryland Meter & Manufacturing Co., Baltimore, Md.. 218
Nathaniel Tufts Meter Co., Boston, Mass. 218

HOT WATER HEATERS.

Humphrey Co., Kalamazoo, Mich. 193

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y. 214

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md. 213
Continental Iron Works, Brooklyn, N. Y. 214
Cruse-Kemper Co., Philadelphia, Pa. 200
Davis & Farnum Mfg. Co., Waltham, Mass. 212
Deily & Fowler, Philadelphia, Pa. 216
Economical Gas Apparatus Construc'n Co., Toronto, Ont 211
Kerr Murray Mfg. Co., Fort Wayne, Ind. 213
Logan Iron Works, Brooklyn, N. Y. 216
R. D. Wood & Co., Philadelphia, Pa. 214
Riter-Conley Mfg. Co., Pittsburgh, Pa. 215
Stacey Mfg. Co., Cincinnati, O. 225
Western Gas Construction Co., Fort Wayne, Ind. 176

STORAGE TANKS.

Davis & Farnum Mfg. Co., Waltham, Mass. 212
Stacey Mfg. Co., Cincinnati, O. 215
Western Gas Construction Co., Fort Wayne, Ind. 176

PATENTS, TRADE-MARKS, COPYRIGHTS.

Royal E. Burnham, Washington, D. C. 211

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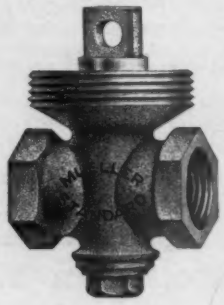

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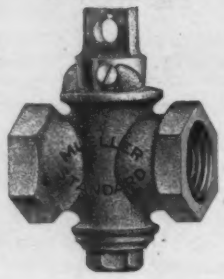

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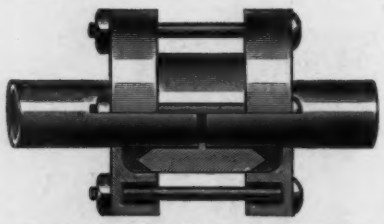

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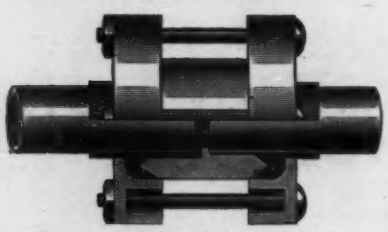

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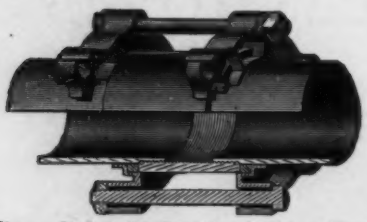

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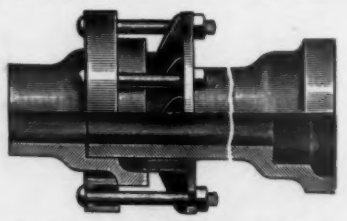
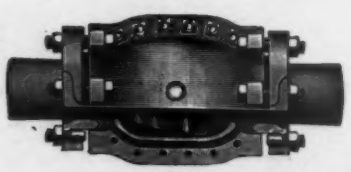
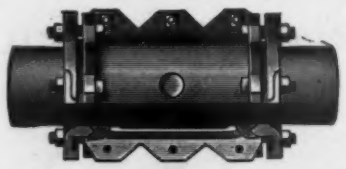


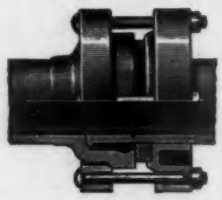
Coupling, Style 9, for Special Style Cast Iron Pipe.



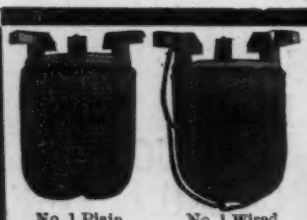
Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.



Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.



Clamp, Style 4½, for Repairing Leaky Lead or Cement Joints in Cast Iron Pipe.



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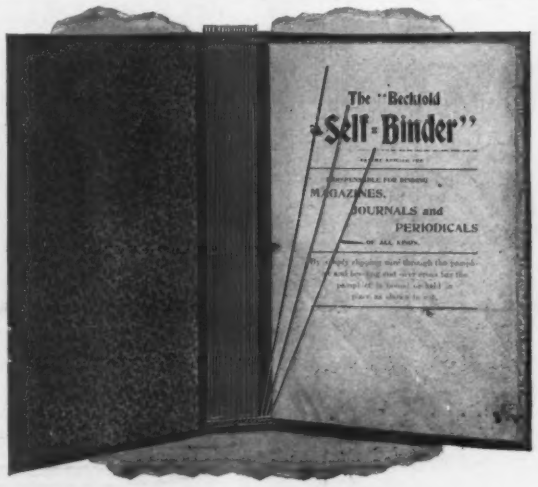

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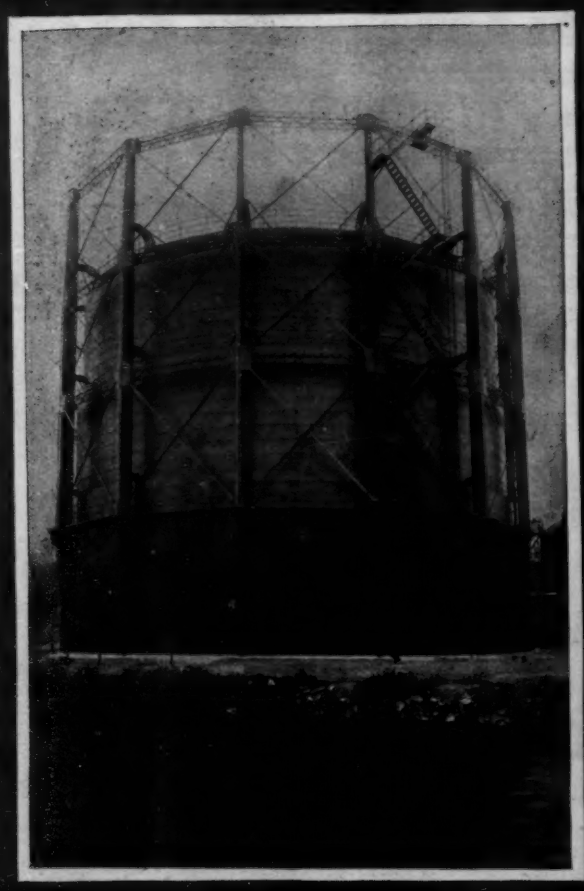

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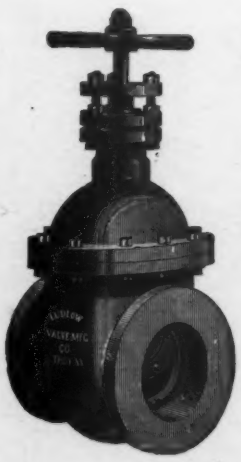

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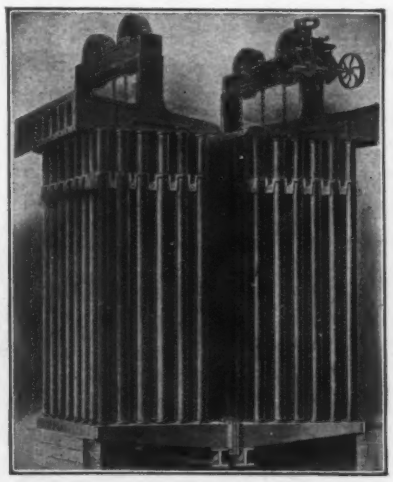

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After the stack-valve gases have passed through the Green Air Heater they may be then passed through a GREEN FUEL ECONOMIZER to heat the boiler feed water, saving as much as 25 per cent. of the boiler fuel. The result is that a Green Air Heater and a Green Fuel Economizer will save from 50 per cent. to 60 per cent. of their first cost annually in a water gas plant. Write for circular "AG" and results of actual tests.

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THE ANSWER IS IN THREE WORDS:
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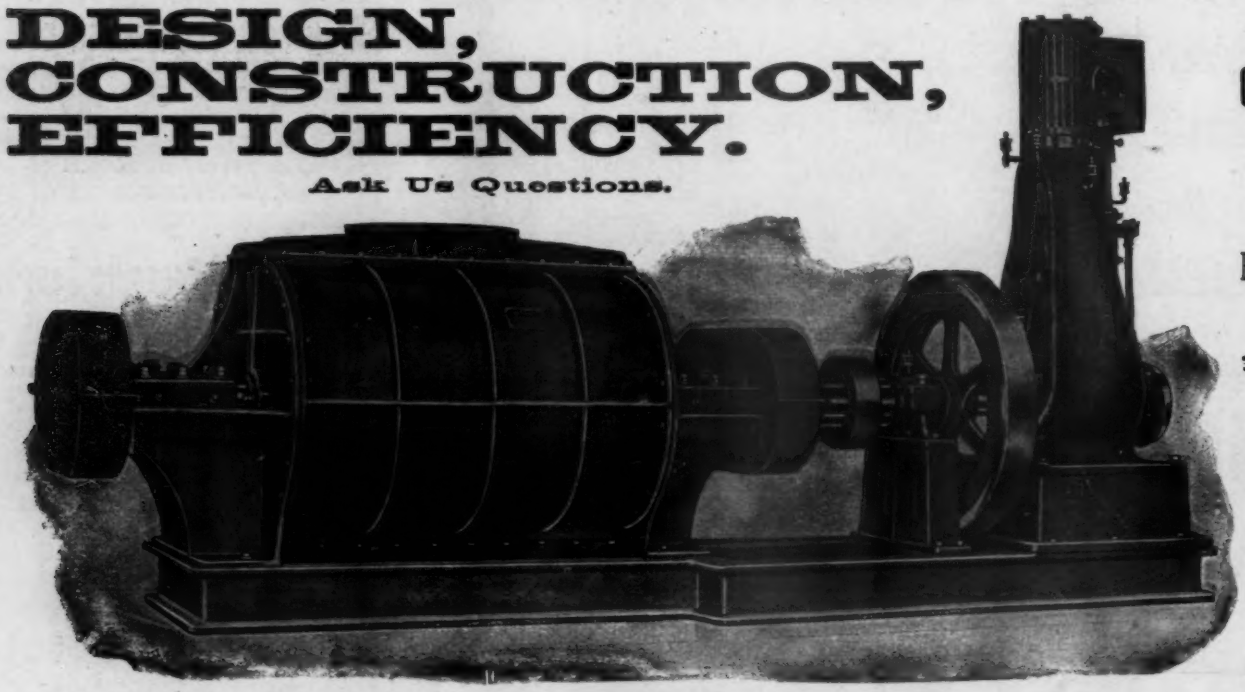
Ask Us Questions.



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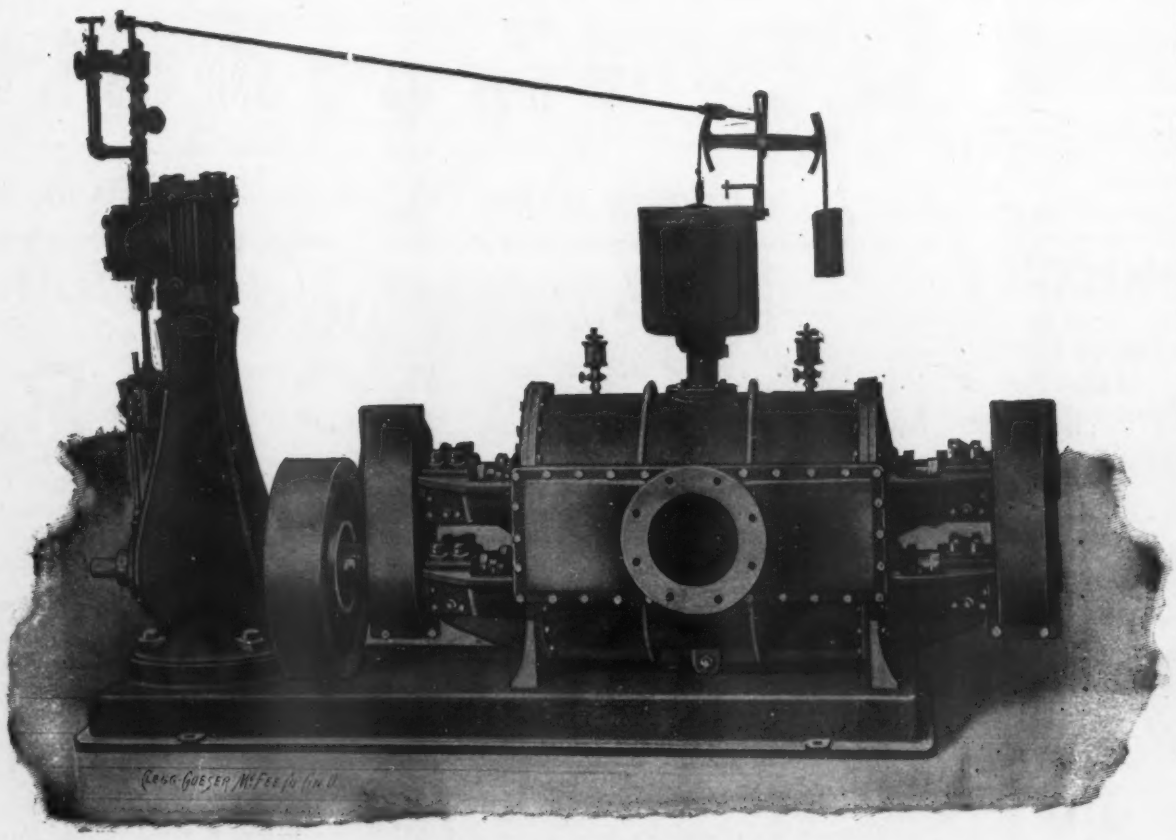
ROOTS' GAS EXHAUSTERS.



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Self-oiling, adjustable bronze bearings.

Most perfect and sensitive Governor.

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We make all sizes for all classes of reduction,

DOUBLE and SINGLE DISTRICT STATIONS,

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HOLDER GOVERNORS

And Low Pressure Regulators, all of the Dry Diaphragm type.

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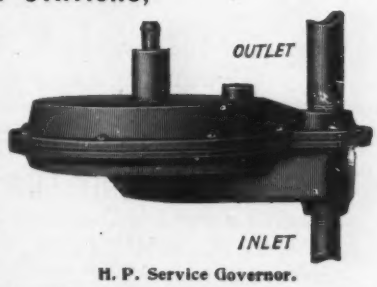

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"HUNT" CABLE RAILWAY AT A GAS WORKS. One of our Methods of HANDLING and STORING COAL and COKE in Gas Plants.

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GAS TAPPING MACHINES

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Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

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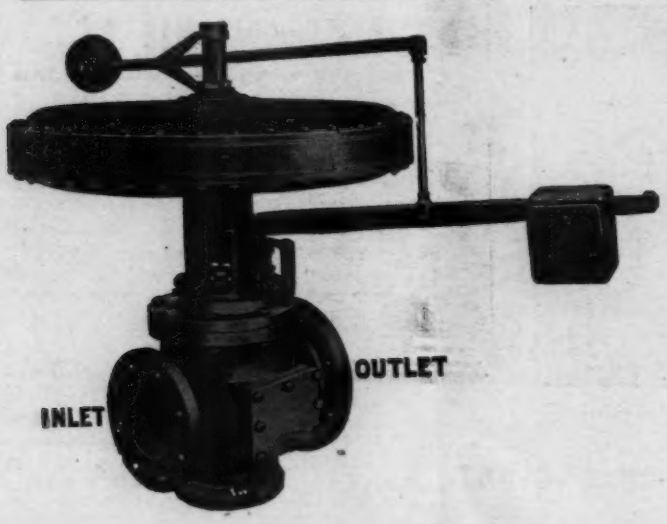

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PUBLIC LIGHTING TABLE.

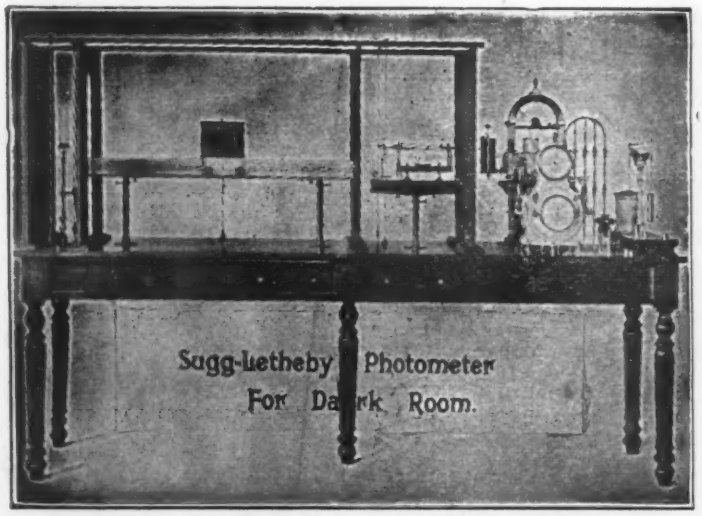
AUGUST, 1907.

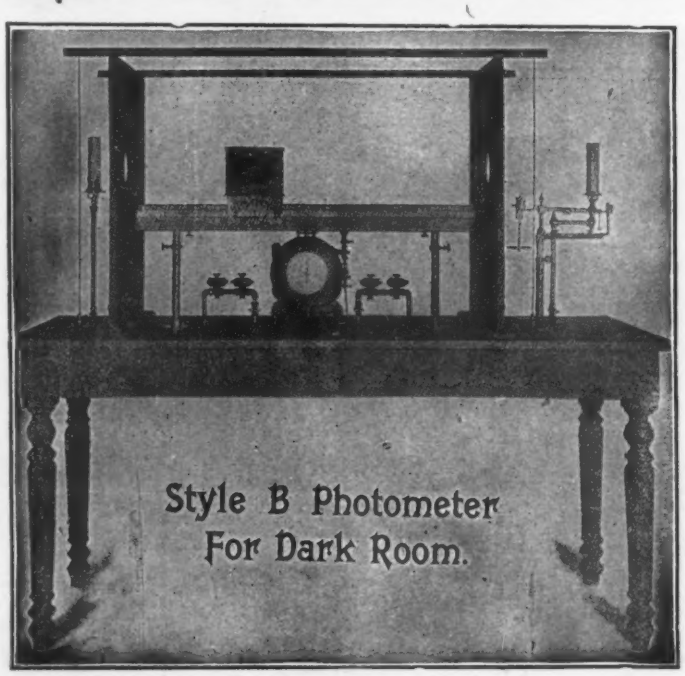
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Thu.	1	7.50 PM	12.50 AM
Fri.	2	7.50	1.30
Sat.	3	7.50	2.00
Sun.	4	7.40	2.40
Mon.	5	7.40	4.00
Tue.	6	7.40	4.00
Wed.	7	7.40	4.00
Thu.	8	7.40 NM	4.00
Fri.	9	7.40	4.00
Sat.	10	7.40	4.00
Sun	11	7.30	4.10
Mon.	12	7.30	4.10
Tue.	13	8.40	4.10
Wed.	14	9.00	4.10
Thu.	15	9.40	4.10
Fri.	16	10.10 FQ	4.10
Sat.	17	10.50	4.10
Sun.	18	11.40	4.20
Mon.	19	12.40 AM	4.20
Tue.	20	1.40	4.20
Wed.	21	2.50	4.20
Thu.	22	No L.	No L.
Fri.	23	No L FM	No L.
Sat.	24	No L.	No L.
Sun.	25	7.10 PM	9.20 PM
Mon.	26	7.10	9.50
Tue.	27	7.10	10.20
Wed.	28	7.10	10.50
Thu.	29	7.10	11.30
Fri.	30	7.10 LQ	12.00
Sat.	31	7.10	12.40 AM

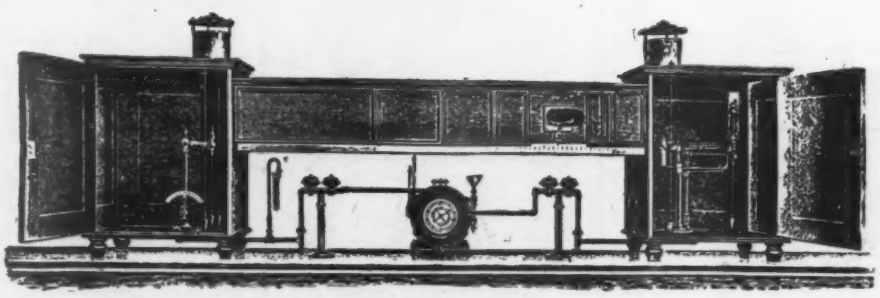
TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs.Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

AUGUST, 1907.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light.	Extinguish.
		P. M.	A.M.
Thu.	1	7.10	3.30
Fri.	2	7.10	3.30
Sat.	3	7.10	3.30
Sun.	4	7.10	3.30
Mon.	5	7.10	3.30
Tue.	6	7.10	3.45
Wed.	7	7.10	3.45
Thu.	8	7.10	3.45
Fri.	9	7.10	3.45
Sat.	10	7.10	3.45
Sun.	11	7.10	3.45
Mon.	12	7.10	3.45
Tue.	13	6.55	4.00
Wed.	14	6.55	4.00
Thu.	15	6.55	4.00
Fri.	16	6.55	4.00
Sat.	17	6.55	4.00
Sun.	18	6.55	4.00
Mon.	19	6.55	4.00
Tue.	20	6.45	4.10
Wed.	21	6.45	4.10
Thu.	22	6.45	4.10
Fri.	23	6.45	4.10
Sat.	24	6.45	4.10
Sun.	25	6.45	4.10
Mon.	26	6.45	4.10
Tue.	27	6.30	4.20
Wed.	28	6.30	4.20
Thu.	29	6.30	4.20
Fri.	30	6.30	4.20
Sat.	31	6.30	4.20

TOTAL HOURS DURING 1907.

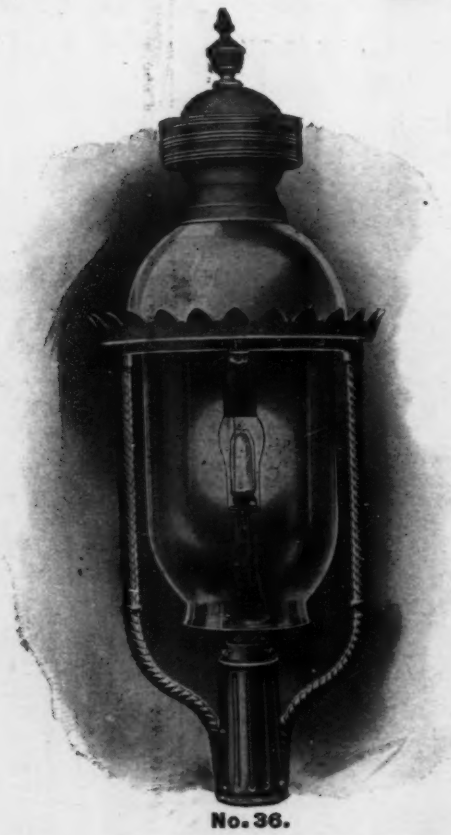
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street.
BOSTON, 820 Beacon Building.
PHILADELPHIA, Broad and Arch Streets.
ST. LOUIS, 712 Roe Building.
CHICAGO, 218 La Salle Street.
SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY

....OF AMERICA....



No. 36.

Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

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Succeeds and Excels the Electric Light at One-Quarter the Cost.

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Perfect Combustion.
Lowest Gas Consumption.
Highest Candle Power.
Will Fit Any Fixture.
Will Not Flash Back.
Will Not Blacken Mantles.
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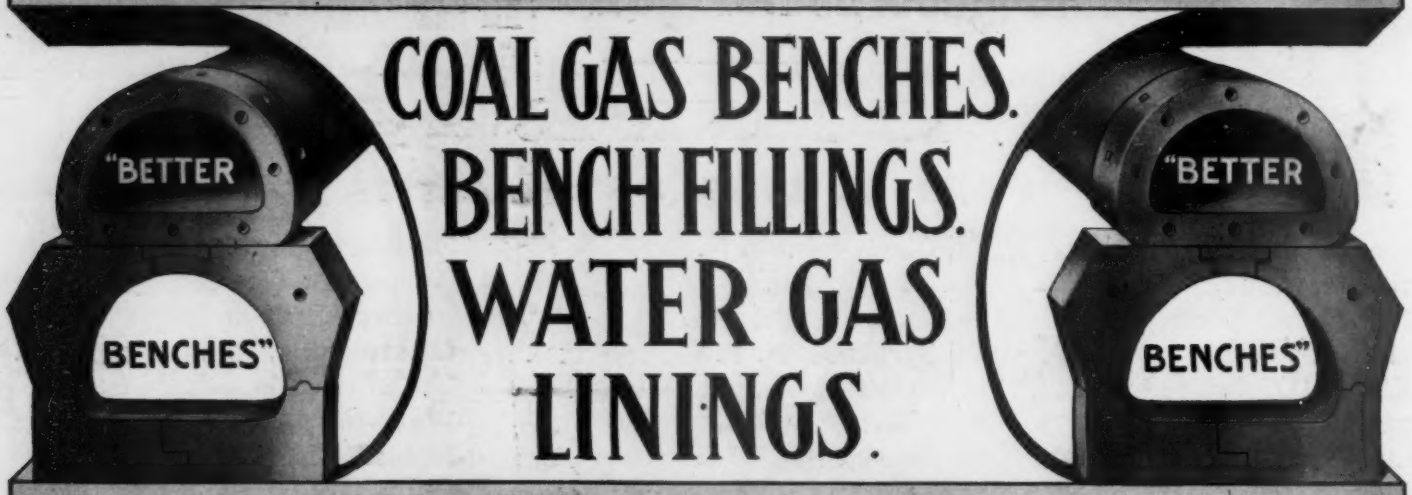

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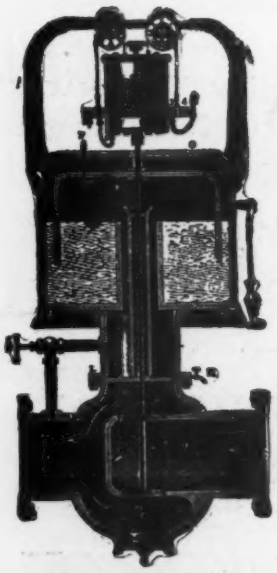

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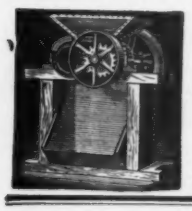

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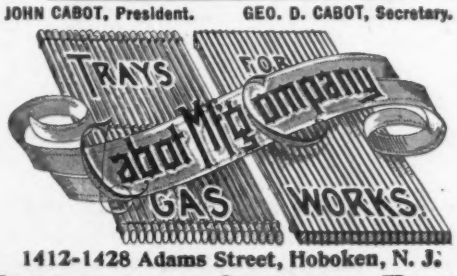

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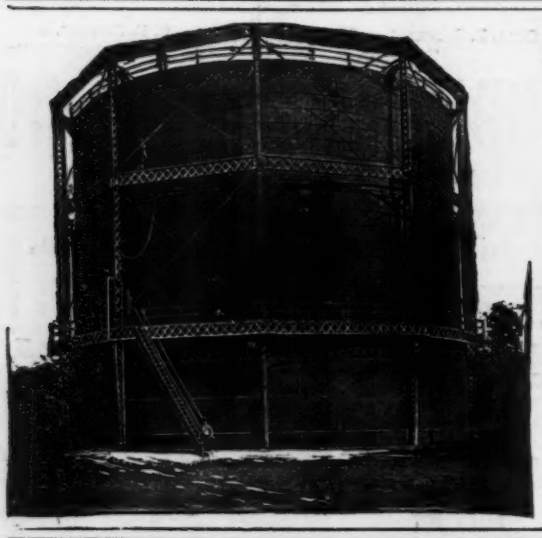

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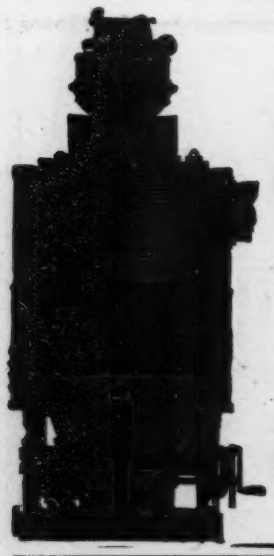

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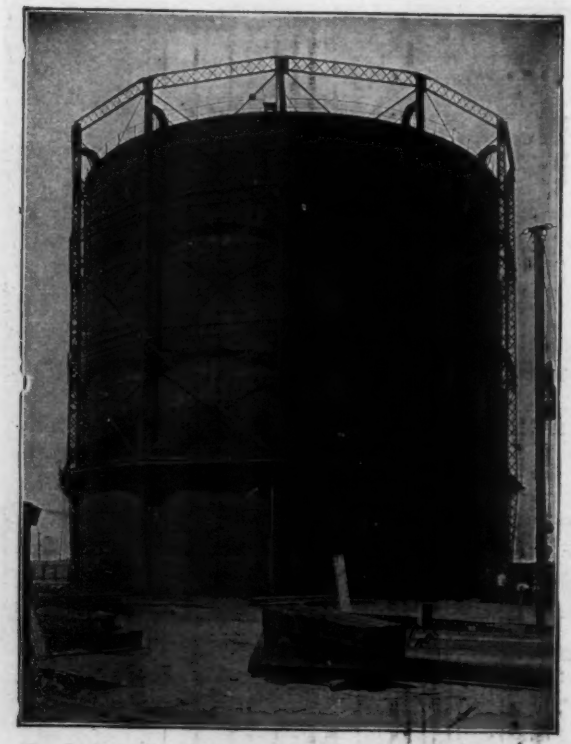

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REPAIRING CAREFULLY DONE.

THE POSITIVE PREPAYMENT METER.

500,000 OF THESE PREPAYMENT METERS ARE IN USE IN THE UNITED STATES, AND THE DEMAND IS STEADILY INCREASING.

If you have some ordinary meters to be repaired, send them to us and let us repair and convert them into prepayment meters. They will be a source of satisfaction and profit to you.

SEND FOR OUR CATALOGUE AND OUR PREPAYMENT BOOKLET.